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Research

Complementary and alternative medicine: a survey of its use in pediatric cardiology

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Abstract

Background: The use of complementary and alternative medicine is high among children and youth with chronic illnesses, including patients with cardiac conditions. Our goal was to assess the prevalence and patterns of such use among patients presenting to academic pediatric cardiology clinics in Canada.

Methods: A survey instrument was developed to inquire about current or previous use of complementary and alternative medicine products and practices, including indications, beliefs, sources of information and whether this use was discussed with physicians. Between February and July 2007, the survey was administered to patients (or their parents/guardians) presenting to 2 hospital-based cardiology clinics: the Stollery Children's Hospital in Edmonton, Alberta, and the Children's Hospital of Eastern Ontario in Ottawa, Ontario.

Results: At the Stollery Children's Hospital, 64.1% of the 145 respondents had used complementary and alternative medicine compared with 35.5% of the 31 respondents at the Children's Hospital of Eastern Ontario (p = 0.003). Overall, the most common products in current use were multivitamins (70.6%), vitamin C (22.1%), calcium (13.2%), unspecified "cold remedies" (11.8%) and fish oil or omega-3 fatty acids (11.8%). The most common practices in current use were massage (37.5%), faith healing (25.0%), chiropractic (20.0%), aromatherapy (15.0%) and Aboriginal healing (7.5%). Many patients (44.9%) used complementary and alternative medicine products at the same time as conventional prescription drugs. Concurrent use was discussed with physicians or pharmacists by 64.3% and 31.3% of respondents, respectively.

Interpretation: Use of complementary and alternative medicine products and practices was high among patients seen in the pediatric cardiology clinics in our study. Most respondents believed that the use of these products and practices was helpful; few reported harms and many did not discuss this use with their physicians, increasing the potential for interactions with prescribed medications.

The use of complementary and alternative medicine is increasing among adults and children,[1] and, among children, the highest rates of use are often found among those with a chronic, recurrent or incurable illness.[2,3] Although many studies of the use of these medicines have been conducted in adult patients with cardiac conditions, few data exist on their use in pediatric cardiology. In a Canadian study of patients with cardiovascular disease, 38% used vitamins and 17% used herbal products.[4] Because these patients are often simultaneously prescribed conventional medications, interactions between drugs and natural health products are of particular concern.

In a large US survey, 18% of adults reported concurrent use of herbal products or large-dose vitamins and conventional drugs.[5] In a more recent study, 20% of children or their caregivers visiting a Canadian emergency department reported the child's concurrent use of conventional and complementary and alternative medicines.[6]

The objective of this study was to assess the prevalence and patterns of the use of complementary and alternative medicines among patients presenting to 2 academic pediatric cardiology clinics in Canada.

Methods

This study was a subset of a larger study carried out at the Children's Hospital of Eastern Ontario (CHEO) in Ottawa, Ontario, and the Stollery Children's Hospital in Edmonton, Alberta. Patients of 5 pediatric subspecialty clinics (cardiol-

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ogy, gastrointestinal, neurology, oncology and respiratory) were surveyed at both locations.[7] Surveys were administered by a research assistant to all patients in clinic waiting rooms between February and July 2007. Children and their families were eligible to participate if they had not previously filled out a survey, could read French or English and the child was under 18 years of age.

At the time of the study, no standard tool for assessing pediatric use of complementary and alternative medicine existed; thus, one was developed according to established methods[8–10] and based on a literature review and earlier surveys.[11–14] The survey was pilot tested to establish concept validity, translated into French and tested again. The survey contained 19 questions about demographics, health status, use of complementary and alternative medicine (both current and lifetime use), reasons for use, concurrent use with conventional medicine, satisfaction with care, adverse effects and disclosure about use.

Statistical analysis

Data were entered into an SPSS 11 database. Missing data were treated as missing responses and denominators were adjusted accordingly. Descriptive statistics were tabulated as medians (with interquartile range) or means (with standard deviation) for continuous scaled variables and numbers and percentages for categorical variables. Variables were compared by site (Stollery v. CHEO) using independent t tests, Wilcoxon tests and χ^2 tests as appropriate.

The use of complementary and alternative medicine was modelled by univariable and multivariable logistic regression models. Predictor variables included child's age, sex, health status, ethnicity, time since diagnosis, caregiver use of complementary and alternative medicine, parents' education and income, family's insurance coverage of such medicines and discussion of these medicines with a conventional medical practitioner. Regression diagnostics, such as R^2, Hosmer and Lemeshow's goodness-of-fit test and the C statistic, were carried out. Measures to detect outliers and influential observations were likewise considered.

Ethics approval

The study was approved by the University of Alberta Human Research Ethics Board.

Results

A total of 188 families were approached. Five declined to participate and a further 7 were excluded because the patient was too old. Of 176 completed surveys, 145 were from Edmonton and 31 from Ottawa. Data from the 2 sites were combined unless they were significantly different.

Population characteristics

The mean patient age was 7.3 years and 57.1% were male (Tables 1 and 2). Most respondents reported the patient's ethnic origin as white (39.5%) or Canadian/French Canadian (38.3%). The health status of most patients ranged from good to excellent (89.1%) and most (63.0%) had received their current diagnosis more than 12 months earlier. The use of complementary and alternative medicine at any time in the child's life was reported by 59.1% of respondents: use was significantly higher at the Stollery (64.1%) compared with CHEO (35.5%) (p = 0.003). In contrast, most (67.7%) respondents at CHEO reported having insurance coverage for these medications and practices compared with only 38.7% at the Stollery (p = 0.01). Of the respondents, 40.9% used complementary and alternative medicine at the same time as conventional medicine.

The mean age of caregivers was 37.4 years. Most (80.7%) were mothers, most (96.6%) rated their own health as good to excellent and most used complementary and alternative medicine (72.2%). The only difference between caregivers at the 2 sites was those at CHEO were more highly educated (p = 0.04).

Statistical modelling showed that, for the Stollery group, the odds of the child using complementary and alternative medicine increased by 1.6 for every 5-year increase in age (95% confidence interval [CI] 1.02–2.7). Respondents who described themselves as white were 3.8 times more likely to use complementary and alternative medicine compared with all other ethnic groups combined (95% CI 1.3–11.7), and children whose parents used complementary and alternative medicine were 35.2 times (95% CI 10.6–116.8) more likely to use complementary and alternative medicine, while adjusting for other factors. For the CHEO group, there were no significant predictors, although parent use of complementary and alternative medicine bordered on significance.

Products and practices

Use of complementary and alternative medicine was divided into 2 categories: products and practices (Table 3). The products most often in current use by children included multivitamins (70.6%), vitamin C (22.1%), probiotics (8.8%) and echinacea (4.4%). We observed a significant difference between sites in the use of probiotics (Stollery 5.0%, CHEO 37.5%, p = 0.02), folic acid (Stollery 1.7%, CHEO 25.0%, p = 0.04) and fish oil (Stollery 8.3%, CHEO 37.5%, p = 0.05). Of note, only 8 respondents had used multivitamins but no other complementary and alternative medicine products or practices; if they are excluded, the rate of use of these medications drops by only 4.6%, from 59.1% to 54.5%, suggesting that the rate does not reflect multivitamin use alone.

In terms of complementary and alternative medicine practices, those most commonly used by children included massage (37.5%), faith healing (25.0%), chiropractic (20.0%) and aromatherapy (15.0%). Patterns of lifetime use were the same or higher than for current use.

Products considered most helpful by respondents who used them were cold remedies (88.9%), teething remedies (84.6%), vitamins and minerals (66.5%) and echinacea (62.5%). Practices that were considered the most helpful were faith healing (100.0%) and massage (91.3%) (Table 2).

Safety issues

Of 176 respondents, 7 (4.0%) reported a total of 12 adverse effects. Nine were self-rated as minor in severity, whereas 3 were rated as moderate (1 each for multivitamins, calcium and yoga); no severe adverse events were reported. Respondents provided no further details about these events.

Concurrent use of prescription drugs and complementary and alternative medicine was reported by 44 (44.9% of 104) respondents and, of these, 32 provided further information about specific treatments. Approximately a third (28.1%) of the latter reported using more than 1 type of complementary and alternative medicine product or practice and 3 patients

Table 1: Demographic information for patients who responded to the survey at Stollery Children's Hospital and the Children's Hospital of Eastern Ontario, February to July 2007

Characteristic	Stollery		CHEO		Both sites, no. (%) or mean ± SD
	*n**	No. (%) or mean ± SD	*n**	No. (%) or mean ± SD	
Patients					
Age, mean ± SD	145	7.0 ± 5.6	31	8.6 ± 5.0	7.3 ± 5.5
Sex, male	144	81 (56.3)	31	19 (61.3)	100 (57.1)
Ethnicity	136		31		
White		54 (39.7)		12 (38.7)	66 (39.5)
Canadian/French Canadian		50 (36.8)		14 (45.2)	64 (38.3)
Aboriginal/Native/Metis/Inuit		18 (13.2)		4 (12.9)	22 (13.2)
East Indian		9 (6.6)		1 (3.2)	10 (6.0)
Asian		7 (5.1)		1 (3.2)	8 (4.8)
Black		3 (2.2)		0	3 (1.8)
Middle Eastern		5 (3.7)		0	5 (3.0)
Latin American/Mexican		4 (2.9)		1 (3.2)	5 (3.0)
Health status†	145		31		
Excellent		33 (22.8)		4 (12.9)	37 (21.0)
Very good		64 (44.1)		10 (32.3)	74 (42.0)
Good		32 (22.1)		14 (45.2)	46 (26.1)
Fair		15 (10.3)		2 (6.5)	17 (9.7)
Poor		1 (0.7)		1 (3.2)	2 (1.1)
Time since diagnosis, mo	142		31		
0–3		31 (21.8)		4 (12.9)	35 (20.2)
> 3–6		11 (7.7)		1 (3.2)	12 (6.9)
> 6–12		14 (9.9)		3 (9.7)	17 (9.8)
> 12		86 (60.6)		23 (74.2)	109 (63.0)
Use of CAM in lifetime, yes‡	145	93 (64.1)	31	11 (35.5)	104 (59.1)
Timing of CAM use	82		11		
Before conventional medicine		9 (11.0)		1 (9.1)	10 (10.8)
Concurrent with conventional medicine		34 (41.5)		4 (36.4)	38 (40.9)
After conventional medicine was successful		0		0	0
After conventional medicine failed		2 (2.4)		0	2 (2.2)
Instead of conventional medicine		5 (6.1)		0	5 (5.4)

Note: CAM = complementary and alternative medicine, CEGEP = Collège d'enseignement général et professionnel, CHEO = Children's Hospital of Eastern Ontario, SD = standard deviation.
*Number of valid responses.
†Significantly higher at CHEO than Stollery ($p = 0.008$).
‡Significantly higher at Stollery than CHEO ($p = 0.003$).
§Significantly higher at CHEO than Stollery ($p = 0.04$).
¶Significantly higher at CHEO than Stollery ($p = 0.01$).

reported using at least 10 types of these medicines concurrently with conventional medications, although it is unknown whether the former were used concurrently with each other.

Concurrent use of complementary and alternative medicine was most common among those taking antihypertensive agents (31.3%) and diuretics (28.1%) (Table 4). The most common complementary and alternative medicine products that patients combined with their conventional drugs were vitamins and minerals (68.8%), homeopathy (15.6%), probiotics (15.6%), fish oil/omega-3 fatty acids (12.5%) and herbal products (9.4%). Concurrent use of these medications was discussed with physicians or pharmacists by 64.3% and 31.3% of respondents, respectively.

The most common sources of information on complementary and alternative medicine included family (64.8%), health food stores (40.7%), health care providers other than the cardiology clinic (35.2%) and books and magazines (34.1%). The most trusted sources were other health care providers (8.5), the cardiology clinic (8.4) and family (8.2), as scored on a 10-point Likert scale, where 1 indicated no trust and 10 indicated complete trust.

Most respondents agreed or strongly agreed that they felt comfortable discussing complementary and alternative medicine in their cardiology clinic (78.4%), would like more information on such medicine from their cardiology clinic (53.5%) and would be more likely to use complementary and alternative medicine products (53.5%) and practices (58.9%) if they were available in their cardiology clinic.

Nearly half (40.9%) of patients reported never using complementary and alternative medicine. Reasons for non-use were similar among patients and caregivers and included not knowing enough about these medicines (44.8% and 50.0%, respectively), worry about adverse effects from combining them with conven-

Table 2: Demographic information for caregivers who responded to the survey at Stollery Children's Hospital and the Children's Hospital of Eastern Ontario, February to July 2007

Characteristic	Stollery		CHEO		Both sites, no. (%) or mean ± SD
	*n**	No. (%) or mean ± SD	*n**	No. (%) or mean ± SD	
Parents/caregivers					
Age, mean ± SD	141	36.8 ± 9.2	31	40 ± 7.2	37.4 ± 8.9
Sex, male	143	22 (15.4)	30	5 (16.7)	27 (15.6)
Highest completed level of education	140		30		
No formal education		0		0	0
Primary school only		3 (2.1)		0	3 (1.8)
Secondary school		44 (31.4)		8 (26.7)	52 (30.6)
Registered apprentice or trade		7 (5.0)		1 (3.3)	8 (4.7)
College, CEGEP or other non-university		41 (29.3)		9 (30.3)	50 (29.4)
University, without a degree		14 (10.0)		1 (3.3)	15 (8.8)
University graduate§		27 (19.3)		11 (36.7)	38 (22.4)
Other		4 (2.9)		0	4 (2.4)
Annual household income, $	128		30		
< 10 000		3 (2.3)		0	3 (1.9)
10 000–19 999		10 (7.8)		2 (6.7)	12 (7.6)
20 000–39 999		20 (15.6)		2 (6.7)	22 (13.9)
40 000–79 999		41 (32.0)		11 (36.7)	52 (32.9)
≥ 80 000		54 (42.2)		15 (50.0)	69 (43.7)
Availability of insurance for CAM	145	55 (38.7)	31	21 (67.7)	76 (43.9)
Use of CAM in lifetime, yes	145	105 (72.4)	31	22 (71.0)	127 (72.2)

Note: CAM = complementary and alternative medicine, CEGEP = Collège d'enseignement général et professionnel, CHEO = Children's Hospital of Eastern Ontario, SD = standard deviation.
*Number of valid responses.
†Significantly higher at CHEO than Stollery ($p = 0.008$).
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tional care (32.8% and 15.0%, respectively) and not believing them to be necessary (22.4% and 35.0%, respectively).

Interpretation

This study shows that patients seen at 2 pediatric cardiology outpatient clinics in Canada are likely to be using complementary and alternative medicine; almost 60% of respondents answering our survey reported such use sometime during the child's lifetime.

Multivariable analysis showed that patient age, self-identifying as white and use of complementary and alternative medicine by parents or caregivers were significantly associated with increased use of complementary and alternative medicine by the child, with the latter factor the strongest predictor. Although we expected that insurance coverage of complementary and alternative medicine would be associated with higher use, this was not evident in our study.

Almost half (44.9%) of respondents reported concurrent use of complementary and alternative medicine (most commonly vitamins and minerals) and conventional drugs by the child. A third of these respondents did not disclose this concurrent use to their physician.

Explanation and comparison with other studies

The rates of use of complementary and alternative medicine shown in our study are similar to those in other studies of chronically ill children, where lifetime use has been reported at 64%.[2] However, it is difficult to compare these rates directly, as the definition of such medicine varies, especially with respect to vitamins, which are considered to be complementary and alternative medicines in some studies but not in others.[2,3] Of note, in our study, excluding patients who had used only multivitamins did not change the rate of use of complementary and alternative medicine by much. Many patients used multivitamins, but most also used another type of complementary and alternative medicine.

The importance of predictor variables in our models is supported by a recent US study that reported parent education and use of prescription medicine as predictors of complementary and alternative medicine use.[15]

The rate of concurrent use of complementary and alternative medicine and conventional drugs found in our study is considerably higher than those reported in previous studies (3% to 20%).[5,6] One possible explanation could be that chron-

Table 3: Complementary and alternative medicine products and practices commonly used by patients seen in pediatric cardiology clinics at Stollery Children's Hospital and the Children's Hospital of Eastern Ontario and their perceived helpfulness.

Product or practice	Current use, no. (%)	Ever used, no. (%)	Perceived helpful, no. (%)			
			*n**	Yes	No	Maybe
Product	*n* = 68	*n* = 95				
Vitamins and minerals	56 (82.4)	86 (90.5)				
Multivitamin	48 (70.6)	72 (75.8)	72	35 (48.6)	4 (5.6)	33 (45.8)
Vitamin C	15 (22.1)	31 (32.6)	29	19 (65.5)	1 (3.4)	9 (31.0)
Calcium	9 (13.2)	15 (15.8)	13	8 (61.5)	1 (7.7)	4 (30.8)
Vitamin B	2 (2.9)	12 (12.6)	10	5 (50.0)	1 (10.0)	4 (40.0)
Herbals	8 (11.8)	28 (29.5)				
Echinacea	3 (4.4)	17 (17.9)†	16	10 (62.5)	1 (6.3)	5 (31.3)
Homeopathics	12 (17.6)	36 (37.9)				
Cold remedy	8 (11.8)	21 (22.1)	18	16 (88.9)	1 (5.6)	1 (5.6)
Teething remedy	2 (2.9)	13 (13.7)	13	11 (84.6)	0 (0)	2 (15.4)
Miscellaneous	17 (25.0)	37 (38.9)				
Fish oil/omega 3 fatty acids	8 (11.8)†	16 (16.8)	13	2 (15.4)	0	11 (84.6)
Acidophilus/probiotics	6 (8.8)†	14 (14.7)†	12	7 (58.3)	1 (8.3)	4 (33.3)
Practice	*n* = 40	*n* = 65				
Massage	15 (37.5)	26 (40.0)	23	21 (91.3)	0	2 (8.7)
Faith healing	10 (25.0)	16 (24.6)	12	12 (100.0)	0	0
Chiropractic	8 (20.0)	21 (32.3)	20	14 (70.0)	3 (15.0)	3 (15.0)
Aromatherapy	6 (15.0)	12 (18.5)	11	8 (72.7)	0	3 (27.3)
Aboriginal healing	3 (7.5)	7 (10.8)	6	5 (83.3)	0 (0)	1 (16.7)

*Number of valid responses.
†Significant difference between the 2 sites ($p < 0.05$).

ically ill children are more likely to be prescribed long-term medication than, for example, patients in an emergency department setting, which may increase the potential for concurrent use of complementary and alternative medicine. In addition, the data collection methods used to determine the use of complementary and alternative medicine are diverse. In our study, we enquired about both current and lifetime use of such medicine, but used only lifetime use figures for examination of concurrent usage, whereas previous studies have focused on a limited time period.

Limitations

We are aware of the limitations inherent in surveys completed by proxy (in this case parents and caregivers) regarding past events, such as previous use of complementary and alternative medicine by their children. On the other hand, it is a standard of care to ask parents for detailed descriptions of their child's medical history at clinic appointments, particularly when the child has a chronic or serious illness. In addition, given the young age of the children in our sample, it seems reasonable that caregivers would be aware of their use of complementary and alternative medicine, as they are likely the ones who purchased it. Recent evidence suggests that the use of product-specific questions reveals significantly higher prevalence than simple recall of products used, thus suggesting that the format of the survey used in this study may help to overcome some limits of recall.[16]

Because the use of complementary and alternative medicine may vary among ethnic groups,[17–21] and because we

Table 4: Concurrent use of conventional prescription drugs and complementary and alternative medicine by patients seen in pediatric cardiology clinics at Stollery Children's Hospital and the Children's Hospital of Eastern Ontario.

Conventional drug	No. of users (%) *n* = 32	CAM products used concurrently	No. CAM users
Anticoagulants	3 (9.4)	Vitamins and minerals	3
		Miscellaneous	1
Antihypertensive agents*	10 (31.3)	Vitamins and minerals	8
		Herbals	1
		Miscellaneous	4
		Homeopathy	2
Beta-blockers	3 (9.4)	Vitamins and minerals	2
		Homeopathy	1
Diuretic agents	9 (28.1)	Vitamins and minerals	7
		Herbals	1
		Miscellaneous	2
Cardiac glycosides	3 (9.4)	Vitamins and minerals	1
		Herbals	1
		Homeopathy	1
Antithrombotic agents	2 (6.3)	Vitamins and minerals	2
		Miscellaneous	1
Hypothyroid agents	3 (9.4)	Vitamins and minerals	1
		Homeopathy	1
Antibiotics	6 (18.8)	Vitamins and minerals	3
		Herbals	1
		Miscellaneous	2
Others	15 (46.9)	Vitamins and minerals	11
		Herbals	1
		Miscellaneous	5
		Homeopathic	3

Note: CAM = complementary and alternative medicine.
*Includes calcium-channel blockers and angiotensin-converting-enzyme inhibitors.
†Proton-pump inhibitors (2), domperidone (1), anticonvulsants (3), morphine (1), quetiapine (1), anti-asthmatic agents (2), epinephrine (1), sildenafil (1), psychostimulants (2), antidepressants (1), ursodeoxycholic acid (1), antihistamines (1), clonidine (1), laxatives (1), chemotherapeutics (2), glycopyrrolate (1), insulin (2).

administered the surveys only in French and English, our findings may not be representative of other ethnic groups.

The questionnaire was limited in how much detail was obtained. For example, because information about adverse events, beyond occurrence and severity, was not captured, it was not possible to do more than speculate about a relation between such events and the use of complementary and alternative medicine. When effectiveness is not known, safety is paramount, and much more needs to be done to document the safety of complementary and alternative medicine in children with cardiac conditions.

Research assistants at CHEO were available for a shorter time, resulting in a smaller number of participants there than at the Stollery.

Implications for practice and future research

It is no surprise that vitamins and minerals were the most common type of natural health product used concurrently with conventional drugs. However, despite their frequent concurrent use, caution is recommended because of the potential for interactions. For example, concurrent use of vitamin C and β-blockers may lead to decreased absorption of the latter.[22] Thiazide diuretics are known to raise blood calcium level,[23] especially if used concurrently with vitamin D,[22] and care should, therefore, also be taken when using them together with calcium supplements. Respondents in our sample population of patients attending a pediatric cardiology clinic described the child taking these combinations. One reported a moderate adverse effect related to calcium use, where the patient had also taken thiazide diuretics, but no details were provided on the nature of the adverse effect.

Caution is especially warranted for those using drugs with narrow therapeutic margins. Known for its many interactions with other conventional medicines, warfarin has been found to have several interactions with dietary supplements. It is notable that, in our study, all of the patients who were taking warfarin also used complementary and alternative medicines. Warfarin has been shown to interact with vitamins,[22] including A, C, E, K and niacin, most of which are commonly included in children's multivitamins; all of the patients in our study group who were taking warfarin also reported concurrent use of vitamins and minerals. In addition, warfarin's concurrent use with fish oils must be monitored, as the combination increases risk of bleeding.[24]

Concurrent use of conventional drugs and complementary and alternative medicine is not necessarily unsafe, and most respondents did not report experiencing harm. However, more primary data establishing the safety of such concurrent use are urgently needed. Some combinations may be helpful, such as the use of antibiotics with probiotics, commonly reported by respondents. Numerous trials have suggested that probiotics may be effective in preventing antibiotic-associated diarrhea.[25,26] The prevention of diarrhea may be especially important among children with cardiac conditions, because sudden changes in fluid balance could be detrimental. Similarly, therapeutic synergy could result from concurrent use of antihypertensive medications and fish oils or omega-3 fatty acids, which have been reported to have antihypertensive properties.[27–29] Our concern is not that patients use complementary and alternative medicines to improve their health, but that they do so without disclosure. Patient safety rests on disclosure and discussion of all health practices, so that adverse events can be avoided.

A third of respondents did not disclose their concurrent use of complementary and alternative medicine and conventional treatment with their physicians. In light of respondents' opinion that the most common sources of information about complementary and alternative medicine were family members and health food stores, a concerning picture emerges regarding physician knowledge of these products and practices. Only 21% of respondents said that they had received information about complementary and alternative medicine from their cardiology clinic, even though approximately half of respondents would have liked more information about such medicine from their clinic. This confirms the importance of discussing the use of complementary and alternative medicine with patients, not only because it is important for the physician to know what products and practices their patients are using in addition to the prescribed ones, but patients also wish to receive information regarding complementary and alternative medicine from their physicians.

Conclusion

Use of complementary and alternative medicine was common among patients seen in pediatric cardiology clinics in our study, but a large number of patients or their caregivers did not report this use to their physicians. Respondents indicated a desire to receive more information regarding complementary and alternative medicine from the cardiology clinic. Physicians should discuss the use of complementary and alternative medicine with these patients and their caregivers, not only to promote patient safety, but also to help support the physician–patient relationship.

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