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Herbal, Vitamin, and Mineral Supplement Use in Patients Enrolled in a Cardiac Rehabilitation Program

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Abstract

PURPOSE—The use of complementary and alternative medicine is common and continues to rise each year, both in the general population and among those with cardiovascular disease. While some supplements may incur risk, particularly when used concomitantly with cardiovascular medications, others have proven benefits. However, supplements such as antioxidants and many herbs can have significant interactions with cardiovascular medications. This study aimed to identify the percentage of patients enrolled in a cardiac rehabilitation program taking herbal, vitamin, and mineral supplements.

METHODS—Electronic and paper charts of 235 patients enrolled in a phase 3 cardiac rehabilitation program were reviewed. Their demographics, medical history, and medications were stratified in an Excel chart, using a large matrix from which data were imported into Matlab for analysis. Custom Matlab programs were created and compiled to determine variables of interest, including percentages of patients with a specific medical condition taking certain supplements.

RESULTS—Sixty-seven percent of patients enrolled in the cardiac rehabilitation program were taking vitamins, with or without minerals (67%, 158 of 235). Multivitamin is the most common form of supplement (51%, 119 of 235), followed by fish oil/omega-3 polyunsaturated fatty acids (27%, 64 of 235).

CONCLUSION—The majority of patients in a phase 3 cardiac rehabilitation program are taking some form of herbal, vitamin, or mineral supplement. Given frequent, complicated patient medication regimens, it is important to educate patients on the potential benefits as well as lack of evidence and possible dangers of supplements.

Keywords

cardiac rehabilitation; herbal; vitamin and mineral supplement use

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The use of complementary and alternative medicine (CAM) continues to increase each year. According to the National Center for Complementary and Alternative Medicine, 83 million US adults spend \$33.9 billion out of pocket in CAM, comprising 11.2% of out-of-pocket expenditures on health care.¹ Forty-four percent of this cost was spent on the purchase of herbal and natural products.¹ *Complementary and alternative medicine* is defined as the use of a group of diverse medical and health care systems, practices, and products that are not generally considered part of conventional allopathic medicine. Complementary and alternative medicine can be used as a method of treating disease that may not be supported by a biological and scientific model. According to the 2007 National Health Interview Survey, 1 of 3 adults uses some form of CAM, the most common of which is herbal, vitamin, and mineral use.² It has also been shown that the use of CAM in patients with cardiovascular (CV) disease, especially herbal therapy, mirrors the use in the general population.³ While some studies have described the use of CAM practices, such as tai chi, yoga, meditation, and acupuncture, in a cardiac rehabilitation setting, little is known regarding the pattern of supplement use in this patient population.⁴⁻⁶

While some supplements may be beneficial, others either have inconclusive evidence supporting their use or have proven to be harmful. In this study, our objective was to describe the use of herbal, vitamin, and mineral supplements in patients enrolled in a cardiac rehabilitation program. We also aimed to identify patients with known coronary artery disease (CAD) that were concurrently taking omega-3 polyunsaturated fatty acids (PUFA), antioxidants, B vitamins, and coenzyme Q10.

METHODS

Participants were enrolled in a phase 3 university-based cardiac rehabilitation program (Table 1). The program had enrolled 235 patients at the time of this study (60%/40% male/female) with the majority of patient ages ranging from 55–84 years. The majority of patients had known CAD (71%), hyperlipidemia (87%), and hypertension (77%). Those without a history of CV disease either had CV disease risk factors or were family members without any known medical conditions. Patients who had a previous cardiac event were all at least 3 months postevent.

Data Collection

Medical records from the cardiac rehabilitation program were reviewed for gender, age, medical history, medications, and supplement use. Through self-reported information, an assigned case manager (nurse, physical therapist, or exercise physiologist) updated these records monthly. When case managers screened patients for supplement use, only general supplement use was asked (ie, no specific supplements were mentioned by the case managers). Patient electronic medical records, when available, were reviewed to confirm medical history and medication profile. Patient demographics, medical history, and medications were then stratified in an Excel chart to be used for analysis.

Definitions of Variables

A history of CAD was considered present if the patient self-reported CAD, a documented cardiac event, percutaneous coronary intervention or angiography showing disease, or history of coronary artery bypass grafting. Left ventricular dysfunction, systolic or diastolic, was included through patient self-report or transthoracic or transesophageal echocardiogram or if there was a discharge summary or clinic visit summary confirming an ejection fraction less than 50%. On the basis of previous literature on supplement use in patients with CV disease, we investigated the use of supplements that have been shown to have potential clinical benefits or harm and supplements without clinical evidence for these effects. Herbal supplements were defined as any form of plant or natural product. Using review articles identifying potential supplements that may interact with CV medications, we identified specific herbal supplements (Table 2).

Data Analysis

Excel data were imported into Matlab for analysis. A large (235×90) data matrix, consisting of all reported medical conditions and supplement use, was generated. Custom Matlab programs were created and compiled to determine variables of interest, including percentages of patients with specific medical conditions taking certain supplements.

RESULTS

Of the 235 patients enrolled in the phase 3 cardiac rehabilitation program, 67% (158 of 235) were taking vitamin or mineral supplements and 38% (91 of 235) were taking herbal or natural products (Table 3), higher than the national rate of 18%.² Of the patients who took herbal or natural products, the most common were omega-3 PUFAs in the form of fish oil or an omega-3 supplement. Other herbal use was not common, while the next most common supplements reported were garlic and cranberry supplements, only having 5 and 4 users, respectively.

Of the patients with known CAD, only 31% of patients (51 of 166) reported taking omega-3 PUFAs. This was similar to the percentage of omega-3 PUFA use in patients with history of myocardial infarction (MI) (25%; 16 of 63), coronary artery bypass grafting (35%; 24 of 69), or angiography with evidence of CAD (34%; 28 of 82) (Table 4). Although the use of omega-3 PUFA is low among patients enrolled, there are more patients on omega-3 PUFA with CAD than those without CAD (Table 5).

The most common vitamin and mineral use was multivitamin, with or without minerals (51%) followed by Vitamin D, with or without calcium (22%), niacin (11%), vitamin C (10%), folic acid (9.7%), and vitamin B₁₂ (9.4%) (Table 6). Use of vitamin E was low (4.2%) and only 1 patient used vitamin A/ β -carotene. Use of coenzyme Q10 (CoQ10) was also not high (7.6%), but the majority of the users (13 of 18) had known CAD (Table 7).

DISCUSSION

The documentation of supplement use is important in patients with cardiac disease as its utilization may affect conventional therapy and, at times, cardiac outcomes. One large study

using data from the National Health Institute Survey (NHIS), a population-based survey administered by the Centers of Disease Control and Prevention National Center for Health Statistics, has described supplement use in a large population. The NHIS study found that 36% of 10 572 respondents with CV disease had used CAM therapy (excluding prayer) in the past 12 months and 18% used herbal therapies.³ Although the use of CAM practices has been described previously among patients enrolled in a cardiac rehabilitation program, these studies were limited to nonallopathic practices and have not described supplement use.⁴⁻⁶ Thus, it is unclear which supplements patients may be taking, and what potential risks or benefits these supplements may have in patients with common comorbid conditions, and what interactions these supplements may have with other medications.

To the best of our knowledge, this study is the first to outline the use of herbal, vitamin, and mineral supplements in patients enrolled in a cardiac rehabilitation program. Our results show that supplement use is common in patients with CV disease and mirrors use in the general population of patients with CV disease. We found that the majority of patients were taking vitamin/ mineral supplements (67%, 158 of 235) and 1 of 3 was taking herbal/natural supplements. The most common supplement used was omega-3 PUFA. By contrast, of the patients with CV disease in the NHIS study that used herbal supplements, 12% used fish/oil/ omega-3 fatty acids (2% of the entire respondents with CV disease).

Despite the evidence that omega-3 PUFA may decrease the incidence of CV events, we found that the rates of use in patients enrolled in our cardiac rehabilitation program who have known CAD and a history of MI are relatively low. The consumption of omega-3 PUFA has been shown in prospective, retrospective, and randomized clinical trials (RCTs) to decrease major CV events, such as MI, sudden cardiac death, atrial fibrillation, and death in patients with chronic heart failure.⁷⁻¹⁶ While some RCTs have not shown differences in CV events, mortality, or revascularization in patients with history of CV disease,¹⁷⁻¹⁹ other randomized trials have shown significant reduction in CV events and mortality with the use of omega-3 PUFA.^{9,12,20} Subgroup analyses from these trials have further shown a decrease in the incidence of sudden cardiac death and progression of left ventricular systolic dysfunction.^{10,21} Despite conflicting studies, the American Heart Association has recommended daily use of omega-3 PUFA in the form of docosahexaenoic acid and eicosapentaenoic acid for the secondary prevention of CV disease.¹¹

In light of null results from the Atherothrombosis Intervention in Metabolic Syndrome with Low HDL/ High Triglycerides: Impact on Global Health Outcomes study, the indication for niacin continues to be not well defined.²² Niacin has previously been shown in combination with statin to significantly decrease atherosclerosis and CV events.²³⁻²⁶ In patients with known CAD, niacin may be part of a comprehensive treatment plan, particularly in patients already treated with statins but whose low-density lipoprotein is not yet at goal. Niacin use was modest (11%) in this phase 3 cardiac rehabilitation program.

Given that oxidative processes play a crucial role in the pathophysiology of atherosclerotic heart disease, theoretically supplementing with antioxidants should improve or even reverse the progression of CAD. While some studies have shown no benefit from antioxidant use, other studies performed in high-risk patients for CV disease have actually shown adverse

outcomes in all-cause mortality for patients taking vitamins C and E or β -carotene supplements.^{27–29} There appears to be a positive correlation and a dose-dependent relationship between vitamin E supplementation and mortality.²⁷ Similarly, some of the beneficial effects of statins and niacin are blunted when taken with antioxidants.^{26,29,30} Our results demonstrate that few patients are taking antioxidants (with or without statins). We also investigated the concomitant use of statins, niacin, and antioxidants. The use of all 3 together was surprisingly low in our patient population. One potential explanation for this finding may be the increasing media attention to the adverse effects and overuse of antioxidants. In addition, because most of our patients were already taking general multivitamins, many patients might feel that a multivitamin alone is sufficient supplementation. Nevertheless, continued screening for potential harmful combinations is needed as the use of herbal and vitamin supplements is steadily increasing. Such screening could be accomplished via routine pharmacy consults, which can increase identification and patient awareness of interactions between medications and supplements.

In our study, the use of vitamin B and CoQ10, though present, was low. Elevated homocysteine level has been shown to be associated with the development of atherosclerotic heart disease, stroke, and myocardial ischemia.^{31–34} B vitamins, particularly folic acid, have been shown to reduce levels of homocysteine.^{35–37} However, the results of clinical trials using B vitamins are inconclusive and inconsistent and do not show improvement in the risk of CV disease.^{38–40} Consumers have shown an increase in interest in CoQ10 as clinical evidence raises the question of potential beneficial effects on CV disease.⁴¹ There is increasing evidence for a potential role of CoQ10 in symptomatic heart failure and hypertension.^{42–49} Because lipid peroxidation and oxidative processes play a central role in the progression of heart disease and hypertension, respectively, CoQ10 may play a preventive role in these disease processes. In addition, there remains unproven benefit of CoQ10 in reducing statin-related myalgias. Presently, large RCTs are still needed to confirm cardiac benefits. Patients must be informed of the poor or insufficient data supporting the use of vitamin B and CoQ10 in secondary CV disease prevention.

One major limitation of this study is the reliance on self-reported data regarding supplementation, which may reflect broader social perceptions of supplement use. For example, many patients may not consider certain herbal products as supplements; consequently, they may fail to disclose supplement use to providers unless specifically asked. As supplements are often regarded as safe over-the-counter products, many users may not consider potential interactions with existing medications or adverse health effects from vitamins and/or herbal products. Such effects become increasingly important in the older population as an increase in age is associated with more chronic diseases for which supplementation may be used. Thus, aggressive screening in the older population may be warranted.

Another limitation of this study is that the data were collected from a small patient population limited to 1 university-based program. Because the use of supplements may vary with region, future multicenter studies may better reflect the practices of patients with CV disease. Moreover, such large studies could better quantify patient supplement use, further

strengthening the validity of our results. Finally, future studies could be designed to improve the understanding of patient motivation for taking supplements and perception of efficacy.

CONCLUSION

The majority of patients in a phase 3 cardiac rehabilitation program are taking some form of herbal, vitamin, or mineral supplement. Considering that these patients frequently have a complicated medication regimen, it is important to educate patients on the potential benefits as well as lack of evidence and possible dangers of supplements. Despite evidence that omega-3 PUFAs and niacin may decrease the incidence of CV events, the use in patients enrolled in this cardiac rehabilitation cohort who have known CAD is low.

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Table 1**Baseline Demographic and Clinical Characteristics**

	n	%
Gender		
Male	141	60
Female	94	40
Age, y		
54	10	4
55–64	46	20
65–74	77	33
75–84	76	32
85+	26	11
Medical conditions		
Known CAD	166	71
Myocardial infarction	63	27
PCI or angiography showing disease	82	35
Coronary artery bypass graft	69	29
LV systolic dysfunction	58	25
LV diastolic dysfunction	34	14
Arrhythmia	71	30
Hyperlipidemia	205	87
Hypertension	181	77
Diabetes	53	23
Chronic kidney disease	18	8
Cerebrovascular accident	24	10
Medications		
Aspirin	172	73
Coumadin	40	17
Clopidogrel	48	20
Statin	193	82
Calcium channel blocker	59	25
β -blocker	141	60
ACE inhibitor	142	60
Diuretics	90	38
Digoxin	5	2
Antiarrhythmics	11	5
Alpha blockers	30	13

Abbreviations: ACE, angiotensin-converting enzyme; CAD, coronary artery disease; LV, left ventricular; PCI, percutaneous coronary intervention.

Table 2

Supplements Used or Screened for Use

	n
Vitamins	
Multivitamin	119
B1 (thiamine)	0
B2 (riboflavin)	0
B3 (niacin)	25
B5 (pantothenic acid)	1
B6 (pyridoxine)	8
B7 (biotin)	7
B9 (folic acid)	23
B12 (cobalamin)	22
Vitamin A	1
Vitamin C	24
Vitamin E	10
Minerals	
Calcium	51
Magnesium	31
Zinc	5
Selenium	2
Natural supplements	
Alfalfa	0
Aloe vera	0
Cod fish oil	2
Cranberry	4
Echinacea	1
Evening primrose	1
Flax seed	3
Garlic	5
Ginger	0
Ginseng	2
Ginkgo	0
Grapefruit	0
Green tea	0
Hawthorne	1
Licorice	2
Milk thistle	2
Omega-3 PUFA/fish oil	64
Peppermint	0
Saw palmetto	3
Soy	0

	n
St. John's wort	0
Yohimbine	0
Vitamin-like or other supplements	
Glucosamine w/wo chondroitin	27
Shark cartilage	1
Coenzyme Q10	18
Phytosterols	1
Super enzyme	2
Soy lethicin	1

Abbreviation: PUFA, polyunsaturated fatty acids.

Table 3

Frequency of Vitamin, Mineral, or Herbal Supplement Use (N = 235)

	Vitamin or Mineral Supplement, n (%)	Herbal Supplement, n (%)	No Supplement, n (%)
Gender			
Male	90 (38.3)	61 (26.0)	42 (17.9)
Female	68 (28.9)	30 (12.8)	25 (10.6)
Age, y			
54	7 (3.0)	3 (1.3)	5 (2.1)
55–64	25 (10.6)	20 (8.5)	13 (6.8)
65–74	48 (20.4)	32 (13.6)	25 (10.6)
75–84	55 (23.4)	29 (12.3)	19 (8.1)
85+	23 (9.8)	7 (3.0)	5 (2.1)
Medical conditions			
Known coronary artery disease	112 (47.7)	68 (28.9)	48 (20.4)
Myocardial infarction	41 (17.4)	21 (8.9)	20 (8.5)
PCI or angiography showing disease	50 (21.3)	35 (14.9)	28 (11.9)
Coronary artery bypass grafting	51 (21.7)	36 (15.3)	14 (6.0)
Left ventricular systolic dysfunction	37 (15.7)	20 (8.5)	18 (7.7)
Left ventricular diastolic dysfunction	23 (9.8)	15 (6.4)	12 (5.1)
Arrhythmia	52 (22.1)	28 (11.9)	17 (7.2)
Hyperlipidemia	141 (60.0)	84 (35.7)	55 (2.3)
Hypertension	128 (54.5)	73 (31.1)	48 (20.4)
Diabetes	34 (14.5)	21 (8.9)	16 (6.8)
Chronic kidney disease	11 (4.7)	6 (2.6)	7 (3.0)
Cerebrovascular accident	19 (8.1)	6 (2.6)	6 (2.6)
Medications taking			
Aspirin	116 (49.4)	74 (31.2)	49 (20.9)
Coumadin	29 (12.3)	12 (5.1)	10 (4.3)
Plavix	24 (10.2)	19 (8.1)	21 (8.9)
Statin	134 (57.0)	81 (34.5)	51 (21.7)
Calcium channel blocker	48 (20.4)	20 (8.5)	14 (6.0)
β-blocker	89 (37.9)	52 (22.1)	49 (20.9)
ACE inhibitor	96 (40.9)	51 (21.7)	43 (18.3)
Diuretics	54 (23.0)	25 (10.6)	35 (14.9)
Digoxin	3 (1.3)	3 (1.3)	2 (0.9)
Antiarrhythmics	9 (3.8)	4 (1.7)	2 (0.9)
Alpha receptor blockers	21 (8.9)	11 (4.7)	7 (3.0)

Abbreviations: ACE, angiotensin-converting enzyme; PCI, percutaneous coronary intervention.

Table 4

Patients Taking Omega-3 PUFA or Fish Oil (N = 235)

Medical Condition	Omega-3 Fatty Acid or Fish Oil Use, n (%)
Known coronary artery disease	51 (22)
Myocardial infarction	16 (7)
PCI or angiography showing disease	28 (12)
CABG	24 (10)
LV systolic dysfunction	16 (7)
LV diastolic dysfunction	10 (4)
Arrhythmia	16 (7)
Hyperlipidemia	61 (26)
Hypertension	54 (23)
Chronic kidney disease	4 (2)
Cerebrovascular accident	4 (2)
Aspirin use	58 (25)
Statin use	58 (25)
Antiarrhythmic use	4 (2)

Abbreviations: CABG, coronary artery bypass graft; LV, left ventricular; PCI, percutaneous coronary intervention; PUFA, polyunsaturated fatty acids.

Table 5

Omega-3 PUFA Use in Patients With and Without CAD

	Patients With CAD (n = 166)	Patients Without CAD (n = 69)
Omega-3 fatty acid use	51 (31)	13 (19)
No omega-3 fatty acid use	115 (69)	56 (81)

Abbreviations: CAD, coronary artery disease; PUFA, polyunsaturated fatty acids.

Table 6**Vitamin B Use^a**

Medical Condition	Niacin (B ₃)	Pyridoxine (B ₆)	Biotin (B ₇)	Folic Acid (B ₉)	Cobalamin (B ₁₂)	B Complex	B ₆ /B ₁₂ /Folic Acid
Known CAD	21 (9)	8 (3)	6 (3)	20 (9)	19 (8)	2 (<1)	6 (3)
Myocardial infarction	5 (2)	2 (<1)	1 (<1)	10 (4)	7 (3)	0	2 (<1)
PCI or angiography showing disease	13 (6)	4 (2)	3 (1)	4 (2)	9 (4)	1 (<1)	3 (1)
CABG	9 (4)	4 (2)	1 (<1)	13 (6)	10 (4)	2 (<1)	3 (<1)
LV systolic dysfunction	7 (3)	0	1 (<1)	4 (2)	7 (3)	0	0
LV diastolic dysfunction	4 (2)	2 (<1)	1 (<1)	2 (<1)	4 (2)	2 (<1)	2 (<1)
Arrhythmia	6 (3)	3 (1)	1 (<1)	8 (3)	10 (4)	2 (<1)	3 (1)
Hyperlipidemia	25 (11)	8 (3)	7 (3)	23 (10)	21 (9)	2 (<1)	6 (3)
Hypertension	16 (7)	6	6 (3)	18 (8)	17 (7)	2 (<1)	4 (2)

Abbreviations: CABG, coronary artery bypass grafting; CAD, coronary artery disease; LV, left ventricular; PCI, percutaneous coronary intervention.

^aValues represent n (%).

Table 7

Coenzyme Q10

Medical Condition	n (%)
Known CAD	13 (6)
Myocardial infarction	6 (3)
PCI or angiography showing disease	6 (3)
CABG	8 (3)
LV systolic dysfunction	4 (2)
LV diastolic dysfunction	4 (2)
Arrhythmia	6 (3)
Hyperlipidemia	16 (7)
Hypertension	16 (7)

Abbreviations: CABG, coronary artery bypass grafting; CAD, coronary artery disease; LV, left ventricular; PCI, percutaneous coronary intervention.