

# Assessing Clinicians' Knowledge of Herbal Medicine

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More and more patients are asking their health care providers about alternative therapies, but do these providers have the knowledge base to give informed answers? These researchers put a sample of VA physicians and pharmacists to the test.

**T**he use of alternative therapies, particularly herbal medicines, is growing rapidly in the United States. The sale of herbal products has increased by 20% every year since the early 1990s,<sup>1</sup> and in 2000, herbal product sales were estimated to reach \$4 billion.<sup>2</sup> Moreover, it is believed that one in three Americans use herbal medicines each year.<sup>1</sup>

Despite having some similarities to traditional pharmaceutical products (one quarter of which are derived from plants<sup>1</sup>), herbal medicines are classified as dietary supplements and, as such, are not subject to the same set of federal regulations that

govern prescription and over-the-counter drugs. Since March 1999, dietary supplement labeling regulations require herbal supplement labels to include a complete list of ingredients, but information about adverse effects and contraindications are not required to be listed.<sup>3</sup> Yet these products have the same potential to cause adverse reactions as prescription medicines.<sup>4-7</sup> Furthermore, current law allows dietary supplements to list vague, nonspecific indications, which can add to the confusion experienced by both providers and patients.<sup>8</sup>

Although the incidence of adverse reactions generally has been low for many herbal medicines, the increasingly common use of these products, along with loose regulations, may produce a higher rate in the near future. In addition to adverse reactions, herbal medicines can interact with standard pharmaceuticals. Documentation of such interactions is sparse, but there is potential for interactions with serious consequences.<sup>9-15</sup> This issue also may become more problematic in the future: According to surveys, 18% of U.S. adults use prescription drugs concurrently with herbal or vitamin products.<sup>9</sup> The concern may be particularly pressing in elderly patients, who tend to use multiple prescription drugs and herbal products—often without the full knowledge of their health care providers.<sup>16</sup>

Given these conditions, it's imperative that providers be knowledgeable about herbal pharmacology. While data indicate that the number of courses in herbal and other alternative therapies offered at U.S. medical schools is rising,<sup>17</sup> few studies have assessed providers' knowledge of herbal pharmacology. And those that have focus mainly on pharmacists and nurse practitioners<sup>18-20</sup>; we know of no study assessing physicians' knowledge of herbal pharmacology.

In an effort to fill this gap and to assess the knowledge of commonly used herbal products among physicians and pharmacists at a large, academic VA institution, we developed and distributed a self-administered survey. By analyzing the responses, we were able to gain insight into associations between providers' level of knowledge and their demographic, training, and practice characteristics. Here, we report these findings and discuss their implications for future research and educational efforts.

## SURVEY DEVELOPMENT AND ADMINISTRATION

For our study, which was approved by the Institutional Review Board of the VA Greater Los Angeles Healthcare System, Los Angeles, CA, we developed a two-part survey that would both test respondents' knowledge of

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# CLINICIANS' HERBAL KNOWLEDGE

For the purpose of this survey, herbal medicines are defined as crude drugs of plant origin utilized for the treatment of disease states, often of a chronic nature, or to attain or maintain a condition of improved health.

## A. Circle the one best answer.

- This herb may cause significant improvement in pain-free walking distance in individuals with arterial occlusive disease.  
a. echinacea  
b. ginkgo biloba leaf extract  
c. milk thistle  
d. feverfew
- This herb has been shown to improve the symptoms of chronic venous insufficiency in placebo-controlled trials.  
a. hawthorn  
b. feverfew  
c. valerian  
d. horse chestnut
- This herb is commonly used by the elderly for erectile dysfunction.  
a. ginseng  
b. grapeseed extract  
c. yohimbine  
d. ma huang
- This herb is widely used as a panacea but should be avoided in patients with cardiovascular disease or on stimulants.  
a. saw palmetto  
b. goldenseal  
c. pennyroyal  
d. ginseng
- This herb should NOT be used with other psychoactive agents due to its antidepressant effects.  
a. milk thistle  
b. St. John's wort  
c. goldenseal  
d. rosemary

## B. Place a T (true) or F (false) next to the following items.

1. Ginseng is commonly used for the treatment of hypertension.
2. Garlic may prolong bleeding time.
3. Most herbal medicines are regulated by the FDA just like over-the-counter and prescription medications.
4. Echinacea, the most popular medicinal herb in the U.S., has been proven to be an effective prophylactic agent in upper respiratory infections.
5. Saw palmetto is used to treat benign prostatic hyperplasia with minimal side effects.

## C. Write the best matched letter next to the herb. Each herb matches with only one letter.

- |  |  |
|--|--|
| <input type="checkbox"/> 1. ginseng      | a. should not be taken with sedatives or in situations when alertness is required  |
| <input type="checkbox"/> 2. valerian     | b. used as a hepatoprotective agent; diabetics using this herb should monitor their blood glucose more carefully to avoid hypoglycemia |
| <input type="checkbox"/> 3. aloe         | c. side effects include delay in wound healing (with topical use) and diarrhea and hypokalemia (with oral use)                         |
| <input type="checkbox"/> 4. goldenseal   | d. may increase or decrease the INR* when used with warfarin   |
| <input type="checkbox"/> 5. milk thistle | e. popular but unproven cold remedy that is erroneously believed to mask illicit drugs in urine toxicology screens                     |

## D. Please provide the following information about yourself.

- Age: (check one)  
 ≤ 30 years  
 31–40 years  
 41–50 years  
 51–60 years  
 > 60 years
- Gender: (check one)  
 Male  
 Female
- Race/ethnicity (optional): \_\_\_\_\_

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Figure. Survey used to assess health care providers' comprehension of herbal pharmacology. \*INR = international normalized ratio.

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4. Year graduated from medical/pharmacy school: \_\_\_\_\_

5. Did you receive any medical or allied health training/education outside of the United States?  
 No  
 Yes, specify country \_\_\_\_\_

6. Current level of training/practice: (check one)  
 Medicine intern/resident/fellow       Pharmacy resident  
 Staff physician       Staff pharmacist

7. Primary practice type: (check one)  
 General internal medicine       Subspecialty (describe): \_\_\_\_\_  
 Family practice       Other (describe): \_\_\_\_\_

8. How would you rate your comprehension of herbal products? (check one)  
 None → go to item 10  
 A little  
 Moderate  
 A great deal

9. Please indicate your source(s) of comprehension of herbal products. (check all that apply)  
 Conferences       Radio/TV  
 Lectures       Newspapers/magazines  
 Courses       Friends/colleagues  
 Journal articles       Package information  
 Books       Other \_\_\_\_\_  
 Internet

10. Would you attend basic educational programs on herbal products? (check one)  
 No  
 Yes

11. Do you routinely inquire about herbal products when taking a medication history? (check one)  
 No → go to item 13  
 Yes

12. What percent of your patients use herbal products? \_\_\_\_\_

13. Have you ever been asked for advice from your patients regarding herbal products? (check one)  
 No  
 Yes

14. Have you ever recommended an herbal product to a patient? (check one)  
 No  
 Yes

Figure. (continued) Survey used to assess health care providers' comprehension of herbal pharmacology. \*INR = international normalized ratio.

herbal pharmacology and gather useful comparative data (Figure).

The knowledge portion of the survey consisted of 15 questions about herbal pharmacology: five multiple choice (section A), five true or false (section B), and five matching (section C). We formulated these questions based on a review of medical and pharmacy literature, which identified 16 herbal products as being commonly used in the United

States.<sup>1,21,22</sup> The questions addressed the following domains: common indications, common and significant adverse effects that would require the patient to seek medical care, potential interactions with prescription medications, and FDA regulation of herbal medicine. We took particular care to include only those indications, adverse effects, and herb-drug interactions that were well documented in medical and pharmacy literature.

The second portion of the survey (section D) contained 14 questions regarding respondents' demographic, training, and practice characteristics. The goal was to determine whether there were any significant relationships between participants' scores on the first part of the survey and these characteristics. We limited demographic questions to age, gender, and race or ethnicity—the latter of which was optional (in order

to reduce identifying characteristics of the participant). Training questions inquired about the participant's year of graduation from pharmacy or medical school, foreign training, current level of training, and the type of primary practice (specialty and subspecialty). Practice questions addressed the participant's practice of asking patients about herbal product use, the prevalence of herbal product use among the participant's patients, whether the participant has been asked for advice on herbal products, and whether the participant has ever recommended herbal products. We also asked providers to rate their own level of comprehension regarding herbal medications, identify their sources of herbal knowledge (such as colleagues, conferences, or lectures), and indicate their willingness to learn more about herbal therapies.

We administered the survey to a convenience sample of physicians and pharmacists who attended various educational conferences and meetings held at the West Los Angeles Healthcare Center and the Sepulveda Ambulatory Care Center between July 17 and August 31, 2000. Physicians surveyed included residents, fellows, and staff physicians in the department of medicine. Pharmacists surveyed included residents and staff pharmacists. Survey participation was strictly voluntary, and completion served as consent to participate in the study. We ensured confidentiality of respondents by not including identifying information (such as name or social security number) on the survey and by collecting the responses in a sealed box.

**SCORING THE SURVEY**

We scored the 15 knowledge questions in the first part of the survey by counting the correct answers. The unweighted score was obtained by

**Table 1. Herbal knowledge scores and demographic characteristics of participants**

Demographic characteristic	% of sample (n = 70)	Mean weighted score* ± SD
All respondents	100	33 ± 11
Age <sup>†</sup>		
< 30 years	49	37 ± 11
31–40 years	36	30 ± 9
41–50 years	9	27 ± 6
> 50 years	6	40 ± 15
Not specified	1	14
Gender		
Female	69	35 ± 11
Male	31	30 ± 9.5
Race <sup>‡</sup>		
White	33	32 ± 10
Asian	26	39 ± 12
Not specified	41	31 ± 10

\*Scores weighted for the chance probability of guessing the correct answer. Maximum obtainable weighted score = 55. <sup>†</sup>P = .017 by analysis of variance (ANOVA). No significant differences between individual age groups were found using the Tukey-Kramer multiple comparison test. <sup>‡</sup>P = .036 by ANOVA. No significant differences between individual racial groups were found using the Tukey-Kramer multiple comparison test.

awarding one point for each correct answer. In order to control for the chance probability of guessing the correct answer, however, we also formulated a weighted score, which assigned multiple point values depending on the question format. For true or false questions, which had a 50% chance of being guessed correctly, a correct answer was worth two points; for multiple choice questions, which had a 25% chance of being guessed correctly, a correct answer was worth four points; and for matching questions, which had a 20% chance of being guessed correctly, a correct answer was worth five points. Under this system, the maximum weighted score participants could achieve was 55.

We entered the data into a Paradox 4.0 database (Borland, Cupertino, CA) and analyzed them using the Statistical Analysis System (SAS Institute, Cary, NC). Descriptive analysis was performed to obtain mean scores and standard deviation. Student's *t*-test, analysis of variance (ANOVA), and Tukey-Kramer multiple comparison tests were used to determine statistical significance of between-group comparisons, with significance defined as a *P* value of less than .05. Surveys were included in the data analysis only if at least eight of the 15 questions in the first part were answered.

**PARTICIPANT CHARACTERISTICS**  
Of 101 surveys distributed, 72 were returned, resulting in a 71% response rate. Two surveys were excluded from the data analyses, one because it was

**Table 2. Herbal knowledge scores and training characteristics of participants**

Training characteristic	% of sample (n = 70)	Mean weighted score* $\pm$ SD
Graduation year <sup>†</sup>		
1964–1997	36	30 $\pm$ 10
1998–2000	39	40 $\pm$ 9.5
Not specified	10	28 $\pm$ 11
Foreign training		
No	91	33.5 $\pm$ 11
Yes	9	33 $\pm$ 9
Provider type <sup>‡</sup>		
Physicians	49	29 $\pm$ 7.7
Pharmacists	51	38 $\pm$ 11.6
Practice type <sup>§</sup>		
General internal medicine	40	27 $\pm$ 7.7
Internal medicine subspecialties	34	38 $\pm$ 11
Not specified	26	39 $\pm$ 10.6

\*Scores weighted for the chance probability of guessing the correct answer. Maximum obtainable weighted score = 55. <sup>†</sup>*P* = .003 by analysis of variance (ANOVA). <sup>‡</sup>*P* = .0001 by student's *t*-test. <sup>§</sup>*P* = .0001 by ANOVA.

completed by a provider who was neither a pharmacist nor a physician, and another because the first part of the survey was incomplete.

Of the 70 participants remaining, 85% were younger than 40 years, 69% were female, 33% identified themselves as white, 26% identified themselves as Asian, and 41% did not list their race (Table 1). Participants' training characteristics were as follows: 39% had graduated between 1998 and 2000, 91% had no foreign training, 51% were pharmacists, and 40% practiced general internal medicine (Table 2).

In practice, more than half (57%) of the participants reported that they routinely ask their patients about herbal product use while taking the medication history, and most (81%)

had been asked by patients for advice about herbal products (Table 3). Only 34%, however, had recommended an herbal product to a patient. When asked to rate their own level of herbal knowledge, 80% described themselves as having either "none" or "a little," and 96% expressed interest in learning more about herbal products.

### PARTICIPANT KNOWLEDGE

The study participants were highly knowledgeable about the lack of regulation of herbal medicines by the FDA, the interaction of St. John's wort with other psychoactive agents, the indications for yohimbine and saw palmetto, and the danger of using ginseng in patients with hypertension (Table 4). They were least knowledgeable about the indications for

horse chestnut in chronic venous insufficiency and ginkgo biloba leaf extract in arterial occlusive disease.

The mean weighted score ( $\pm$  SD) for all participants was 33  $\pm$  11, which is 60% of the maximum obtainable score of 55. We found associations between some of the provider characteristics and weighted scores. The ANOVA test yielded significant differences in weighted score among different age and race groups—though this was not the case when the individual age and racial groups were analyzed using the Tukey-Kramer multiple comparison test. Scores were significantly higher for participants who graduated from pharmacy or medical school between 1998 and 2000 versus those who graduated between 1964 and 1997, pharmacists versus physicians, and providers with internal medicine subspecialties versus general internal medicine providers. We found no difference in scores between staff physicians and medical residents and fellows, or staff pharmacists and pharmacy residents.

Using the Tukey-Kramer multiple comparison test, we did find a significant difference in mean weighted scores according to the participants' self-rated levels of herbal pharmacology knowledge, with those who described themselves as having no knowledge scoring significantly lower than those in the other self-rated groups. In addition, participants whose patients asked them for advice about herbal products scored significantly higher than those whose patients did not.

### COVERING NEW GROUND

To our knowledge, ours is the first study to assess the herbal medicine knowledge of a sample of physicians and pharmacists, including medical fellows and medical and pharmacy

residents, from a large academic institution. Two prior studies investigated pharmacists' knowledge of herbal medicines.<sup>18,19</sup> In addition to the inclusion of physicians, our study differed from both of these in the formulation of each question based on strong support in the medical and pharmacy literature, the format of questions, and the use of weighted scores to control for the chance probability of guessing the correct answer.

In the first study, researchers surveyed 18 pharmacists from a large metropolitan area.<sup>18</sup> In addition to the domains we tested, their survey included questions on dosages, ingredients, and mechanisms of action. Participants' scores ranged from 25% on the dosage domains to 74% on the indication domains. Since the researchers did not report an aggregate mean score, however, it's difficult to compare their findings to ours.

In the second study, investigators surveyed 164 pharmacists and tested the same domains as in our study.<sup>19</sup> They also used 15 questions for the knowledge portion of their survey, though their answer format included only "true," "false," and "I don't know" choices. The inclusion of the "I don't know" choice, which was counted as an incorrect answer, might have contributed to the fact that respondents' mean score in this study (42%) was much lower than the one we found (60%). (The difference is even greater when their mean score of 42% is compared to the mean score of the pharmacist-only sample in our study: 69%.) In addition, their study sample included mostly community pharmacists (68%) and very few from an academic institution (5%), while our sample was drawn exclusively from an academic institution.

The apparent trends toward higher scores among Asian participants and women in our study, which did not reach a significant level, were con-

**Table 3. Herbal knowledge scores and practice characteristics of participants**

Practice characteristic	% of sample (n = 70)	Mean weighted score* ± SD
Provider regularly obtains history of herbal product use		
No	43	31 ± 11
Yes	57	35 ± 10
Patients have asked for advice about herbal products <sup>†</sup>		
No	19	27.5 ± 10
Yes	81	35 ± 11
Provider has recommended herbal product use		
No	65	33 ± 11
Yes	34	35 ± 10
Not specified	1	19
Self-rated level of herbal pharmacology knowledge <sup>‡</sup>		
None	24	26.5 ± 8
A little	56	34 ± 10
Moderate	20	41 ± 11
Provider interested in learning about herbal products		
No	4	32 ± 15
Yes	96	34 ± 11

\*Scores weighted for the chance probability of guessing the correct answer. Maximum obtainable weighted score = 55. <sup>†</sup>P = .027 by student's t-test. <sup>‡</sup>P = .0005 by analysis of variance.

founders, and can be explained by the fact that most pharmacist participants (who scored higher than physicians) were Asian-American women. Similarly, the association of score with age was most likely a reflection of the better performance among participants who had graduated from medical or pharmacy school more recently.

**MEETING THE GROWING DEMAND**

A 2000 study of first-year medical students reported that 84% felt

that knowledge of alternative medical therapies would be important to them as future physicians.<sup>23</sup> Changes in medical and pharmacy school curriculum already reflect this positive attitude toward herbal medicines. Approximately 64% of the medical schools in the United States now offer some courses in alternative medicine (including herbal products),<sup>17,24</sup> and 74% of U.S. pharmacy schools offer at least one course addressing herbal therapies.<sup>25</sup> The higher percentage of pharmacy schools offering



**Table 4. Performance on individual herbal knowledge questions for the entire sample (n = 70)**

Question number	Question topic	No. (%) of correct responses
<b>Section A: Multiple choice</b>		
1	Indication—ginkgo biloba leaf extract	25 (36)
2	Indication—horse chestnut	18 (26)
3	Indication—yohimbine	61 (87)
4	Contraindication—ginseng	36 (51)
5	Drug interaction—St. John's wort	67 (96)
<b>Section B: True or false</b>		
1	Adverse effect—ginseng	58 (83)
2	Adverse effect—garlic	53 (76)
3	Lack of FDA regulation of herbal medicine	70 (100)
4	Indication—echinacea	44 (63)
5	Indication—saw palmetto	58 (83)
<b>Section C: Matching</b>		
1	Drug interaction—ginseng	41 (59)
2	Drug interaction/adverse effect—valerian	42 (60)
3	Adverse effect—aloe	42 (60)
4	Illicit drug interaction—goldenseal	37 (53)
5	Indication and adverse effect—milk thistle	28 (40)

these courses compared with medical schools may have contributed to the higher scores obtained by pharmacists as compared to physicians in our study. And the recent emphasis on herbal instruction and introduction of courses in herbal medicines in medical and pharmacy schools, as reflected by the wide variety of alternative medicine topics being taught,<sup>24,26</sup> may explain the higher scores obtained by the more recent medical and pharmacy graduates in our study.

With the growing use of herbal products in the United States, it is not surprising that 81% of providers in our study have had patients ask them for advice about the use of these medicines. This statistic underscores

the importance of physicians and pharmacists maintaining a basic understanding of herbal pharmacology. The fact that weighted scores correlated with providers' self-assessment of their herbal pharmacology knowledge indicates that these providers are aware of their own level of comprehension on these topics. In addition, it is encouraging that 96% of respondents expressed interest in attending basic educational programs on herbal medicines—especially since the average weighted score of 60% falls below the usual academic standard of passing (70% to 75% at most colleges and universities).

Our finding that the majority of participants were interested in learn-

ing more about herbal medicines is consistent with findings from other studies. For example, Berman and colleagues investigated physicians' attitudes toward complementary or alternative medicine, and reported that 72% expressed interest in learning about herbal therapies. They also reported that the participants would have an increased willingness to recommend herbal medicines (and other alternative treatments) if there were available scientific evidence similar to that for more traditional, or western, treatments.<sup>27</sup>

To accommodate the increasing number of providers who express a desire to learn more about herbal medicines, we recommend that an educational intervention aimed at increasing the knowledge of basic herbal pharmacology be provided to physicians and pharmacists—especially those who graduated before 1997—within the VA Greater Los Angeles Healthcare System and perhaps other VA institutions as well. This would enable more VA health care providers to provide sound advice to their patients about herbal products and to recognize the adverse effects of herbal medications and their interactions with prescription drugs.

## STUDY LIMITATIONS

Our study results can't be generalized widely for several reasons. We used a convenience rather than a random sample, all providers worked in the VA Greater Los Angeles Healthcare System, and our sample included trainees (interns, residents, and fellows). In addition, as with any voluntary survey, it's possible that the providers who chose to participate tended to be those who felt they were knowledgeable in herbal pharmacology, which could overestimate the knowledge score. Similarly, the score may have been overestimated by

Continued on page 84

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## CLINICIANS' HERBAL KNOWLEDGE

Continued from page 75

excluding surveys in which participants failed to answer at least eight questions in the first section—though this effect would likely be minimal since only one survey was excluded for this reason. While our herbal knowledge questions were formulated using a review of medical and pharmacy literature, the survey requires further testing to determine its reliability and validity. Future research should survey a large, random sample of health care providers in both academic and community settings. ●

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