Knowledge Assessment of Military Personnel, Veterans, and Family Taking Dietary Supplements

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MAJ Leah R. Stanley, DNP, CRNA
COL Denise M. Beaumont, DNAP, CRNA

Dietary supplements (DS) pose many side effects and multiple interactions with perioperative medications, which may increase surgical morbidity and mortality. Descriptive empirical data are essentially nonexistent related to DS consumption and patient knowledge of DS. The aims of this study were to investigate the prevalence of use, type of supplements used, and the knowledge base among military beneficiaries and veterans consuming DS during the preoperative period. This descriptive cross-sectional study solicited data from 2,623 volunteer, preoperative patients at 6 different military medical centers throughout the United States. Of the 2,623 participants, 847 (32.3%) reported taking at least 1 DS. Relevant to the surgical population, 154 (18.1%) of participants reported consuming DS that are associated with an increased risk of bleeding. Importantly, we found that 89.7% of patients taking DS were not aware of any potential side effects, and 97.1% lacked knowledge regarding any potential medication interactions between the supplement consumed and their prescribed medications. This vast knowledge gap could have deleterious effects on surgical outcomes. An increase in DS research is needed, and patient education should be incorporated routinely during preoperative assessments provided by military and Veterans Affairs healthcare facilities.

Keywords: Dietary supplements, military, perioperative patients, veterans.

The use of complementary and alternative medicines may pose a substantial risk to the perioperative patient. Complementary and alternative medicines, which include herbal supplements and dietary supplements (DS), are often used by patients who undergo surgical procedures. The surgical population appears to use DS and herbal supplements more frequently than in the general population. Tsen et al reported that 22% of patients who underwent evaluation in a preoperative clinic consume alternative medicines. With the escalating use of nonstandardized, over-the-counter supplements, many patients present to the anesthesia provider self-administering DS. This steep rise in DS and herbal supplement use may be associated with increased morbidity and mortality in the perioperative period resulting from their interactions with other prescribed medications (polypharmacy) or induced alterations in physiology. Kaye et al reported that 32% of ambulatory surgical patients admitted to using DS and herbal supplements. In a recent retrospective review, King et al found that 23% of surgical patients used natural products, and geriatric patients preferred dietary supplements such as fish oil and glucosamine.

In a recent prospective survey study, Levy et al found that 44% of 526 sampled patients had used DS and herbal supplements, with 16.5% reporting using specific supplements that have been shown to potentially interact with anesthesia. Twenty-four participants used supplements preoperatively that could potentially interact with antithrombotic drugs including omega-3 fish oil, ginger, and green tea. Further review of the medical files of 3 of the 24 patients cited actual intraoperative bleeding. However, only 11% of patient records reviewed showed documented supplement use.

Many DS and herbal supplements can interact with frequently used medications including anesthetic agents and may cause serious unforeseen consequences or complications. In a retrospective review of patient records from an anesthesia preoperative evaluation clinic, King et al found that 25% of patients reported the use of natural products. Based on their results, they stressed a need for guidelines regarding discontinuation of selected herbal products.
The 2 major US-based professional anesthesia organizations provide recommendations for dietary or herbal supplement cessation before planned surgical procedures. The American Association of Nurse Anesthetists (AANA) recommends cessation of all herbal/dietary supplements 1 to 2 weeks before a planned surgical procedure. The American Society of Anesthesiologists recommends at least 2 weeks' cessation for certain supplements after consultation with the anesthesia provider.

Few descriptive data exist regarding DS use in the perioperative patient population. Further lacking, and of interest to our research team, is patient knowledge of DS adverse effects in the Military Health System and Veterans Affairs (VA) patients undergoing anesthesia and surgery. Dietary supplements are frequently used by military service personnel, their families, and veterans. In the

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**Figure 1. Knowledge Assessment of Military Personnel and Family Taking Herbal Supplements**

Abbreviation: GED, General Educational Development.

1. Gender? M or F
2. What is your age today? _____
3. What is your ethnic background?
4. What is your rank? _____
5. Beneficiary status (retiree, active duty, reserve, family member)?
6. What is the highest level of education you have completed?
   - Some high school (but no GED or diploma)
   - High school graduate (GED or diploma)
   - Associate's degree (2-year college)
   - Bachelor's degree (4-year college)
   - Some college courses [toward] graduate degree
   - Graduate degree
7. How do you consider your general health?
   - Excellent
   - Good
   - Fair
   - Poor
8. How do you consider your overall fitness level?
   - Excellent
   - Good
   - Fair
   - Poor
9. Do you participate in strength or aerobic training?
10. Do you smoke or chew tobacco?
11. Marital status _____

A total of 6 questions included on the survey instrument related to herbal supplement use.

1. Do you take herbal supplements (please circle)?
   - Yes
   - No
   - (Stop here if NO) –
2. What herbal supplements do you take? Please list all below:

   Please answer questions 2a through 2e for each herbal supplement you take.
   a. Why do you take this herbal supplement? ___________________
   b. How often are you taking the herbal supplement? __________
   c. Does the herbal supplement help the condition for which it is taken?
   d. How confident are you that your herbal supplement will do as it claims?
      - Extremely confident
      - Very confident
      - Somewhat confident
      - Not confident at all
   e. How confident are you that your herbal medication is safe to consume?
      - Extremely confident
      - Very confident
      - Somewhat confident
      - Not confident at all
3. Do you know the side effects of this herbal medication?
   - Yes or No; if yes, what are they? _____________________
4. Do you believe you are having side effects from this herbal medication?
   - Yes or No; if yes, what are they? _____________________
5. Do you know the potential drug interactions of this herbal medication?
   - Yes or No; if yes, what are they? _____________________

   REPEAT QUESTIONS 2 THROUGH 5 FOR EACH HERBAL MEDICATION USED

6. What or who is the source of your herbal supplement information? (Mark all that apply)
   - My supervisor
   - Family members
   - Friends
   - A health professional (doctor, nurse, dietitian, etc)
   - A personal trainer
   - Magazines (such as Men's Health, Muscle and Fitness, Flex, Shape, and SELF)
   - Books
   - Peer review journal (such as Medicine and Science in Sports and Exercise; International Journal of Sports Medicine)
   - Internet
   - Store salesperson
   - Television
   - Other: _____________________

before surgery and recommended further education regarding perioperative implications of natural products.
### Demographic characteristic

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No. (%) of respondents</th>
<th>Respondents who reported taking at least 1 DS, No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2,623 (100.0)</td>
<td>847 (32.3)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1,009 (38.5)</td>
<td>373 (44)</td>
</tr>
<tr>
<td>Male</td>
<td>1,614 (61.5)</td>
<td>474 (56)</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>23 (0.88)</td>
<td>5 (0.6)</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>186 (7.1)</td>
<td>52 (6.1)</td>
</tr>
<tr>
<td>Black or African American</td>
<td>583 (22.2)</td>
<td>171 (20.2)</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>406 (15.5)</td>
<td>122 (14.4)</td>
</tr>
<tr>
<td>White</td>
<td>1,303 (49.7)</td>
<td>458 (54.1)</td>
</tr>
<tr>
<td>Other</td>
<td>122 (4.7)</td>
<td>39 (4.6)</td>
</tr>
<tr>
<td>Beneficiary status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active duty</td>
<td>767 (29.2)</td>
<td>208 (24.6)</td>
</tr>
<tr>
<td>Reserve</td>
<td>14 (0.53)</td>
<td>3 (0.4)</td>
</tr>
<tr>
<td>Veteran(b)</td>
<td>600 (22.9)</td>
<td>167 (19.7)</td>
</tr>
<tr>
<td>Retiree</td>
<td>483 (18.4)</td>
<td>184 (21.7)</td>
</tr>
<tr>
<td>Family member</td>
<td>697 (26.6)</td>
<td>264 (31.2)</td>
</tr>
<tr>
<td>Rank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enlisted 1-4</td>
<td>388 (14.8)</td>
<td>92 (9.9)</td>
</tr>
<tr>
<td>Enlisted 5-9</td>
<td>818 (31.2)</td>
<td>271 (32)</td>
</tr>
<tr>
<td>Officer 1-3</td>
<td>68 (2.6)</td>
<td>25 (2.9)</td>
</tr>
<tr>
<td>Officer 4-6</td>
<td>123 (4.7)</td>
<td>46 (5.4)</td>
</tr>
<tr>
<td>Warrant officer</td>
<td>34 (1.3)</td>
<td>13 (1.6)</td>
</tr>
<tr>
<td>Not applicable</td>
<td>1,192 (45.4)</td>
<td>400 (47.2)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school education</td>
<td>60 (2.3)</td>
<td>14 (1.7)</td>
</tr>
<tr>
<td>High school or GED</td>
<td>1,173 (44.7)</td>
<td>309 (36.5)</td>
</tr>
<tr>
<td>Associate’s degree</td>
<td>528 (20.1)</td>
<td>170 (20.1)</td>
</tr>
<tr>
<td>Bachelor’s degree(c)</td>
<td>558 (21.3)</td>
<td>226 (26.7)</td>
</tr>
<tr>
<td>Graduate degree</td>
<td>304 (11.6)</td>
<td>128 (15.1)</td>
</tr>
<tr>
<td>Age, years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>260 (9.9)</td>
<td>52 (6)</td>
</tr>
<tr>
<td>25-29</td>
<td>243 (9.3)</td>
<td>65 (7.7)</td>
</tr>
<tr>
<td>30-39</td>
<td>493 (18.8)</td>
<td>178 (21)</td>
</tr>
<tr>
<td>40-49</td>
<td>381 (14.5)</td>
<td>128 (15.1)</td>
</tr>
<tr>
<td>50-59</td>
<td>401 (15.3)</td>
<td>147 (17.4)</td>
</tr>
<tr>
<td>60-69</td>
<td>485 (18.5)</td>
<td>156 (18.4)</td>
</tr>
<tr>
<td>70-79</td>
<td>286 (10.9)</td>
<td>92 (10.9)</td>
</tr>
<tr>
<td>≥ 80</td>
<td>74 (2.8)</td>
<td>29 (3.4)</td>
</tr>
<tr>
<td>How do you consider your general health?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>109 (4.2)</td>
<td>32 (3.8)</td>
</tr>
<tr>
<td>Fair</td>
<td>603 (23.0)</td>
<td>175 (20.7)</td>
</tr>
<tr>
<td>Good</td>
<td>1,555 (59.3)</td>
<td>506 (59.7)</td>
</tr>
<tr>
<td>Excellent</td>
<td>356 (13.6)</td>
<td>134 (15.8)</td>
</tr>
<tr>
<td>How do you consider your overall fitness status?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>264 (10.1)</td>
<td>83 (9.8)</td>
</tr>
<tr>
<td>Fair</td>
<td>827 (31.5)</td>
<td>252 (29.8)</td>
</tr>
<tr>
<td>Good</td>
<td>1,262 (48.1)</td>
<td>416 (49.1)</td>
</tr>
<tr>
<td>Excellent</td>
<td>270 (10.3)</td>
<td>96 (11.3)</td>
</tr>
</tbody>
</table>

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Table 1 continues on page 194
Table 1. Preoperative Patients Participating in Multicenter Survey (N = 2,623)
Abbreviations: BMI, body mass index; DS, dietary supplement; GED, General Educational Development.

<table>
<thead>
<tr>
<th>Demographic characteristic</th>
<th>No. (%) of respondents</th>
<th>Respondents who reported taking at least 1 DS, No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you participate in strength or aerobic training?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neither</td>
<td>1,109 (42.3)</td>
<td>311 (36.7)</td>
</tr>
<tr>
<td>Yes</td>
<td>1,514 (57.7)</td>
<td>536 (63.3)</td>
</tr>
<tr>
<td>Do you smoke or chew tobacco?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>2,110 (80.4)</td>
<td>715 (84.4)</td>
</tr>
<tr>
<td>Yes</td>
<td>513 (19.6)</td>
<td>132 (15.6)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>1,873 (71.4)</td>
<td>631 (74.5)</td>
</tr>
<tr>
<td>Widowed</td>
<td>104 (4.0)</td>
<td>29 (3.4)</td>
</tr>
<tr>
<td>Divorced</td>
<td>277 (10.6)</td>
<td>90 (10.6)</td>
</tr>
<tr>
<td>Single</td>
<td>367 (14)</td>
<td>83 (9.8)</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 25</td>
<td>663 (25.3)</td>
<td>208 (24.6)</td>
</tr>
<tr>
<td>25-29.9</td>
<td>1,014 (38.7)</td>
<td>324 (38.3)</td>
</tr>
<tr>
<td>30-39.9</td>
<td>818 (31.2)</td>
<td>278 (32.9)</td>
</tr>
<tr>
<td>&gt; 40</td>
<td>118 (4.5)</td>
<td>37 (4.4)</td>
</tr>
</tbody>
</table>

military subpopulation, the use of DS such as vitamins, minerals, herbas (botanicals), amino acids, and a variety of other substances is different compared with the general population. In a review and meta-analysis, Bovill et al and Lieberman et al found the use of DS by military personnel surpasses that of civilian populations and that selected subgroups in the military may have even higher DS use than the general military population. In a survey that included 39,877 service members, 69% of military personnel were using some form of DS at least 1 time per week. This was further subdivided into categories of multivitamins and minerals (49.5%), antioxidants (34%), individual vitamins or minerals (33.9%), bodybuilding products (27.2%), fish oil (26%), and herbal and weight loss supplements (16.2%). In another survey, composed of 1,708 participants, Knapik et al found DS use among US civilians was about 50%, whereas in US military personnel, use of DS was 60% to 70%. Like athletes, military personnel often have job-related tasks that require extreme and extended periods of strenuous activity, resulting in the use of DS for the ergogenic properties to augment their work-related performance. Service members may be working in austere or deployed environments under extreme conditions with increased risk of injury. Therefore, military personnel may use DS that purportedly improve health, recovery, and performance under these stressful situations. On the other hand, the general US population seems to consume DS primarily for health reasons with minimal concern for performance enhancement.

Despite substantial use of DS throughout civilian and military populations, side effects of these compounds remain largely unknown. According to the US Dietary Supplement Health and Education Act of 1994, there are no requirements for evidence of efficacy, safety, or quality control standards for supplements, which increases the risk of adverse effects related to their use. The World Health Organization reported more than 5,000 suspected herbal supplement–related adverse reactions in 1996. In the US between 1993 and 1998, the Food and Drug Administration documented approximately 2,600 adverse events, including 100 deaths, related to herbal medications. Abe and colleagues described the availability of more than 50,000 supplements and that many may interact adversely with anesthesia. Currently, there is no central repository for documenting adverse outcomes associated with DS interactions; therefore, the true number of adverse effects may be much higher than reported. Understanding the side effects, interactions, and toxicity of DS is an important aspect of patient safety.

Many patients self-medicate with DS to treat a variety of disorders, unaware of potentially harmful pharmaceutical interactions. The combined effects of DS with prescribed pharmaceuticals are such a major patient safety issue that The Joint Commission mandates that all medications and herbal supplements taken by patients be reviewed for possible interactions. For healthcare providers to safely prescribe pharmaceutical treatments,
it is imperative that they are aware of side effects of DS and potential interactions with prescribed medications.

Frequently, patients scheduled for surgery do not receive proper education regarding cessation of their DS or the potential interactions with anesthetic agents. Unfortunately, the data are lacking regarding DS use in the perioperative patient population and, more specifically, in the military and veteran populations that have shown a higher tendency for use. Therefore, the aims of this study were to determine the current prevalence of DS use among US service members, veterans, and family members scheduled for surgery, the types of supplements used, and the study participants’ knowledge base regarding those supplements.

**Methods**

- **Survey.** This research project was a descriptive cross-sectional survey study. Investigators interviewed participants using the “Knowledge Assessment of Military Personnel and Family Taking Herbal Supplements” electronic survey shown in Figure 1. The survey used in this project was adapted and modified with permission from a previously used and published survey from Lieberman et al at the US Army Research Institute of Environmental Medicine. The original survey has been used in multiple survey investigations and has been shown to be reliable and valid.

Validity and reliability testing of the survey was accomplished before data collection. Specifically, the adapted survey was first administered to 3 US Army Graduate Program in Anesthesia Nursing (USAGPAN) faculty members who independently evaluated the survey and deemed the instrument to have face validity. An expert panel of 7 advanced practice nurses established content validity by determining the extent to which each item reflected the specific and intended domain of content. The survey was revised and reworded to achieve a discrimination index of 0.97. After the validity of the instrument was established, the investigators determined the test-retest reliability. The instrument was administered to 43 active-duty military personnel and veterans and their dependents. Two weeks later the same instrument was administered again. Thirty-two individuals completed the instrument at both time intervals. A paired t test indicated no significant difference between the 2 scores (P = .59). A Pearson r was used to calculate

Table 2. Data of Preoperative Patients Who Reported Use of Any Dietary Supplement (n = 847)

<table>
<thead>
<tr>
<th>Survey question</th>
<th>No. (%) of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>How often do you take DS?</td>
<td>638 (75.3)</td>
</tr>
<tr>
<td>Daily</td>
<td>638 (75.3)</td>
</tr>
<tr>
<td>Twice per day</td>
<td>41 (4.9)</td>
</tr>
<tr>
<td>3 times per day</td>
<td>7 (0.8)</td>
</tr>
<tr>
<td>4 times per day</td>
<td>3 (0.4)</td>
</tr>
<tr>
<td>&gt; 4 times per day</td>
<td>1 (0.1)</td>
</tr>
<tr>
<td>Every other day (every 2-3 d)</td>
<td>12 (1.4)</td>
</tr>
<tr>
<td>1-2 times per week</td>
<td>29 (3.4)</td>
</tr>
<tr>
<td>2-3 times per week (several)</td>
<td>26 (3.1)</td>
</tr>
<tr>
<td>3 times per week</td>
<td>19 (2.2)</td>
</tr>
<tr>
<td>3-4 times per week</td>
<td>6 (0.7)</td>
</tr>
<tr>
<td>5-7 times per week</td>
<td>13 (1.5)</td>
</tr>
<tr>
<td>4-5 times per month</td>
<td>1 (0.1)</td>
</tr>
<tr>
<td>Once every month</td>
<td>4 (0.5)</td>
</tr>
<tr>
<td>Once or twice per month</td>
<td>5 (0.6)</td>
</tr>
<tr>
<td>Once every 3-6 mo</td>
<td>4 (0.5)</td>
</tr>
<tr>
<td>When sick, flu season, winter</td>
<td>4 (0.5)</td>
</tr>
<tr>
<td>As needed, occasionally</td>
<td>3 (0.4)</td>
</tr>
<tr>
<td>Other</td>
<td>31 (3.7)</td>
</tr>
<tr>
<td>Does the DS help the condition for which it is taken?</td>
<td>562 (66.4)</td>
</tr>
<tr>
<td>No</td>
<td>21 (2.5)</td>
</tr>
<tr>
<td>Not sure</td>
<td>264 (31.1)</td>
</tr>
<tr>
<td>Yes</td>
<td>562 (66.4)</td>
</tr>
<tr>
<td>How confident are you that your DS will do as it claims?</td>
<td>305 (36.0)</td>
</tr>
<tr>
<td>Not confident at all</td>
<td>44 (5.2)</td>
</tr>
<tr>
<td>Somewhat confident</td>
<td>305 (36.0)</td>
</tr>
<tr>
<td>Very confident</td>
<td>302 (35.7)</td>
</tr>
<tr>
<td>Extremely confident</td>
<td>196 (23.1)</td>
</tr>
<tr>
<td>How confident are you that your DS is safe to consume?</td>
<td>388 (45.8)</td>
</tr>
<tr>
<td>Not confident at all</td>
<td>14 (1.7)</td>
</tr>
<tr>
<td>Somewhat confident</td>
<td>118 (13.9)</td>
</tr>
<tr>
<td>Very confident</td>
<td>388 (45.8)</td>
</tr>
<tr>
<td>Extremely confident</td>
<td>327 (38.6)</td>
</tr>
</tbody>
</table>

Figure 2. Specific Dietary Supplements Used

Abbreviation: BCAA, branch chain amino acid.
the correlation between 2 scores, which was 87.5. The results indicated that the instrument had acceptable test-retest reliability.

Investigators collected the data from William Beaumont Army Medical Center, Fort Bliss, El Paso, Texas; Tripler Army Medical Center, Honolulu, Hawaii; Madigan Army Medical Center, Joint Base Lewis-McChord, Tacoma, Washington; Carl R. Darnall Army Medical Center, Fort Hood, Texas; San Antonio Military Medical Center, Fort Sam Houston, Texas; and Memphis Veterans Affairs Medical Center, Memphis, Tennessee. The population of preoperative/surgical patients at each medical center ranged between 5,800 and 12,000 patients per year. Sample size recruitment was at the higher end of the sample size estimation to account for missing data and attrition. Thus, with a 95% confidence and a ±5% sampling error, a sample of at least 400 adult preoperative/surgical patients (18-89 years old) was obtained at each medical center. Convenience sampling was used to obtain the samples. Data were collected from February 2018 through September 2018 following institutional review board exemption status and site-specific amendment approvals.

The investigators approached potential participants in the preoperative evaluation clinic during routine preanesthetic evaluations or in the surgery holding area immediately before surgery. Before interviewing each patient, the investigators explained the purpose of the study and included a disclaimer, which included the following: all information obtained would remain confidential, participation was voluntary, no direct identifying data would be collected, and participants would be free to withdraw at any time. No incentives were offered to participants for completion of the survey. Prospective participants were assured that their participation in the study was voluntary. Each person was assured of anonymity, and consent was verbally obtained from each patient before completion of the survey.

Survey data collected included the following: gender, age, rank, beneficiary status (retiree, active duty, reserve,
family member, veteran), ethnicity, educational level, general health status, fitness level, body mass index (BMI), tobacco use, marital status, and reason for having the surgery. Additional data collected pertained to the use of any self-administered DS including the following: names and/or types of supplements used, frequency of use, reasons for use, effectiveness, confidence of effectiveness, confidence of safety, knowledge of side effects, knowledge of drug interactions, knowledge of adverse effects in patients undergoing anesthesia, and source of information about the supplement (Figure 1). During the pilot study, if patients inquired as to which supplements were considered herbal supplements, we did not provide a definition of this during the survey. Instead, we had them list all their self-administered supplements to exclude any bias of the subsequent survey questions. Both users and nonusers of DS were included in the sample.

The investigators administered the survey in 1 of 2 ways. Surveys were either administered using the SurveyMonkey platform via electronic devices (Samsung tablets, Samsung Electronics), which were connected to the Internet through a secure server and Internet service provider, or administered via a paper copy of the survey with data collected by hand. All information gathered during the preanesthetic interview was automatically collected and saved real-time via the wireless connection and interface with SurveyMonkey and the data storage platform. For the completed paper copies, a data spreadsheet was created, and subsequently the data were entered into SurveyMonkey. As each entry was made, the corresponding data point on the spreadsheet was concurrently labeled as “entered” to avoid duplicate entries. Data from the surveys remained anonymous assuring confidentiality and were electronically compiled for each specific medical center. Data from each of the medical

<table>
<thead>
<tr>
<th>Why do you take this dietary supplement?</th>
<th>Frequency (%)</th>
<th>Why do you take this dietary supplement?</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>For low levels-deficiencies</td>
<td>119 (14.0)</td>
<td>Fertility</td>
<td>8 (0.9)</td>
</tr>
<tr>
<td>Overall health</td>
<td>105 (12.4)</td>
<td>Brain health</td>
<td>7 (0.8)</td>
</tr>
<tr>
<td>Recommended by healthcare provider</td>
<td>69 (8.1)</td>
<td>Breast feeding</td>
<td>6 (0.7)</td>
</tr>
<tr>
<td>Energy</td>
<td>65 (7.7)</td>
<td>Diabetes-blood glucose regulation</td>
<td>6 (0.7)</td>
</tr>
<tr>
<td>Recommended by someone</td>
<td>38 (4.5)</td>
<td>Depression</td>
<td>6 (0.7)</td>
</tr>
<tr>
<td>Sleep</td>
<td>34 (4.0)</td>
<td>Relax</td>
<td>6 (0.7)</td>
</tr>
<tr>
<td>Joints-arthritis</td>
<td>34 (4.0)</td>
<td>Increase metabolism</td>
<td>5 (0.6)</td>
</tr>
<tr>
<td>Heart health</td>
<td>30 (3.5)</td>
<td>Eye health</td>
<td>5 (0.6)</td>
</tr>
<tr>
<td>Strength-muscle recovery post-workout</td>
<td>29 (3.4)</td>
<td>Prevent cancer</td>
<td>5 (0.6)</td>
</tr>
<tr>
<td>Gastrointestinal health</td>
<td>27 (3.2)</td>
<td>Menopause-hot flashes</td>
<td>4 (0.5)</td>
</tr>
<tr>
<td>Good skin-hair-nails</td>
<td>26 (3.1)</td>
<td>Prevent urinary tract infections</td>
<td>4 (0.5)</td>
</tr>
<tr>
<td>Increase immunity</td>
<td>19 (2.2)</td>
<td>Prostate health</td>
<td>3 (0.4)</td>
</tr>
<tr>
<td>Disease prevention</td>
<td>18 (2.1)</td>
<td>Sexual enhancement</td>
<td>3 (0.4)</td>
</tr>
<tr>
<td>Weight loss</td>
<td>17 (2.0)</td>
<td>Aging</td>
<td>3 (0.4)</td>
</tr>
<tr>
<td>Decrease cholesterol</td>
<td>16 (1.9)</td>
<td>Migraines</td>
<td>2 (0.2)</td>
</tr>
<tr>
<td>Anti-inflammatory</td>
<td>14 (1.7)</td>
<td>Memory</td>
<td>2 (0.2)</td>
</tr>
<tr>
<td>Postbariatric surgery supplement</td>
<td>13 (1.5)</td>
<td>Lower blood pressure</td>
<td>2 (0.2)</td>
</tr>
<tr>
<td>PTSD-stress</td>
<td>11 (1.3)</td>
<td>Chemotherapy</td>
<td>1 (0.1)</td>
</tr>
<tr>
<td>Liver</td>
<td>9 (1.1)</td>
<td>Nausea</td>
<td>1 (0.1)</td>
</tr>
<tr>
<td>Increase circulation-blood flow</td>
<td>9 (1.1)</td>
<td>Other</td>
<td>66 (7.8)</td>
</tr>
</tbody>
</table>

Table 4. Reasons for Taking Dietary Supplements (n = 847)
Abbreviations: DS = dietary supplements; PTSD, posttraumatic stress

Figure 4. Source of Respondents’ Dietary Supplementation Information
centers were also combined as a multicenter cohort.

- **Statistical Analysis.** Completed surveys were exported into a spreadsheet (Excel, Microsoft), and open-ended text answers were recoded numerically to facilitate analyses. Data were imported into SPSS software (version 23.0; IBM Corp) for all statistical analyses. For the demographics, frequencies and proportions were provided for the qualitative variables, and means and standard deviations were provided for the quantitative variables. Pearson \( \chi^2 \) was used for tests of significance between each of the 6 medical centers or survey sites for frequency of DS use.

**Results**

A total of 2,623 preoperative patients were surveyed, and 32.3% of respondents (n = 847) reported at least 1 DS use. In the group of DS users, 56% were male and 44% female; the majority reported being white (54.1%) and married (74.4%). Of the participants, the mean age (SD) was 49.66 (17.0) years, and the mean BMI was 29.1 ± 5.67 kg/m². In regard to educational level, 36.5% of participants reported having a high school education; 20.1%, an associate’s degree; 26.7%, a bachelor’s degree; and 15.1%, a graduate degree. A comparison of the frequency demographic data for the total sample and the 847 DS users can be found in Table 1.

On review of the collected data, we noted that participants reported taking many supplements that did not fit the herbal supplement category. Therefore, to reflect the collected and analyzed data, we modified “Herbal Supplements” in the title of the investigation to “Dietary Supplements.”

Of the 847 patients who reported DS use, 43% (n = 364) reported taking 2 DS; 17% (n = 144), 3 DS; 7.2% (n = 61), 4 DS; 2.1% (n = 18), 5 DS; and 1.7% (n = 14), 6 or more DS. Most patients reported taking the DS daily (75.3%, n = 638); 66.4% (n = 562) believed the DS helps for the condition or reason they take the DS; 58.8% (n = 498) were very or extremely confident that the DS functions as claimed; and 84.4% (n = 715) were very or extremely confident that the DS is safe (Table 2).

Multivitamins followed by fish oil or omega-3 supplements were the most frequently reported DS consumed: 24.8% (n = 210) and 10.3% (n = 87), respectively. The top 10 DS used are shown in Figure 2, and a complete list appears in Table 3. The 2 most frequently cited reasons for using the DS were deficiencies (14%, n = 119) and overall health (12.4%, n = 105) or as shown with the 10 most frequently DS reported in Figure 3 and Table 4. The patients’ source of DS information is shown in Figure 4 with multiple sources (47.2%, n = 400) and personal trainer (15.1%, n = 128) as the most frequently cited.

When asked if the patients who take DS are aware of the potential side effects and interactions with other medications, 10.3% (n = 87) reported they knew the side effects (Figure 5). The 3 most frequently cited known side effects were increased bleeding (n = 9), heart or blood pressure problems (n = 9), and altered mental status (n = 8). Eleven patients or 1.3% (see Figure 5) believed they were having side effects, with altered mentation reported 3 times. Only 2.8% (n = 24)
stated they knew of potential drug interactions with their DS use, with bleeding, drug interactions, and “there are none” reported by 0.47% (n = 4), 0.47% (n = 4), and 0.59% (n = 5) of participants, respectively (see Figure 5).

When DS frequency use was compared between the 6 medical centers, there was a significant relationship between the medical center and taking DS for the full sample of 2,623 participants. Using a 2 × 6 χ² test:

\[ \chi^2(5) = 67.95, \ P < .001 \] (contingency coefficient = .159), Madigan Army Medical Center was significantly different. Examination of the contingency table showed that 48.3% (n = 218) of Madigan Army Medical Center patients took an herbal supplement, whereas 27% (n = 113) of William Beaumont Army Medical Center patients, 27.7% (n = 134) of Memphis Veterans Affairs Medical Center patients, and 27.8% (n = 125) of Tripler Army Medical Center patients used DS (Figure 6).

## Discussion

The aims of this study were to investigate the prevalence of use, type of supplements used, and the knowledge base among military beneficiaries and veterans consuming DS during the preoperative period. From the total sample size of 2,623 preoperative patients surveyed, the prevalence of using at least 1 DS was 32.3%, which is slightly increased but similar to previous reports of active-duty personnel and civilians, including earlier studies in the surgical population.1-3,14,30-33 Earlier studies have reported higher use of DS among military personnel compared with civilians.13,14,16 The present study found 37.8% DS use among civilians but only 30.1% use among military respondents (active duty, reservist, retired, veteran). This could be explained by the present study including only civilians who were family members of military personnel, which is a subgroup of civilians whose DS habits may be influenced by their military affiliation.

Contradictory findings were noted with past studies, including the most recent by Lieberman et al and others,13-16,19 which reported a higher prevalence of up to 70% use of DS among active-duty personnel. Interestingly, in the present study only 24.6% of active-duty military respondents reported DS use. One possible reason for this difference may be that the studies reporting a higher prevalence were conducted among a subgroup of active-duty participants (US Coast Guard personnel) performing physically demanding tasks, whereas the participants in this study were surgical patients who may have been interviewed during a period of light-duty requirements. Therefore, despite the results found in this study, the strenuous nature of an individual’s occupation may directly influence their DS use, as reported previously.13,14,17,19 Furthermore, many of the surveys in this study were conducted by the participants on their day of surgery. This could have led to underreporting by active-duty participants out of concern that declaring DS use might lead to surgery delay or cancellation.

Statistical analysis of data for the full sample of 2,623 survey respondents revealed a significant relationship between the individual medical centers and the prevalence of respondents taking DS at each facility. Madigan Army Medical Center was found to have a significantly higher prevalence of DS consumption with 48.3% of their respondents reporting DS use, compared with 27% of William Beaumont Army Medical Center, 27.7% of Memphis Veterans Affairs Medical Center, and 27.8% of Tripler Army Medical Center respondents. This variation could be because of a variety of factors, including differences in the composition of patient population and regional culture. The Pacific Northwest, where Madigan Army Medical Center is located, has extended periods of overcast skies and receives substantial rainfall. This weather can contribute to a high incidence of seasonal affective disorder and may have led to an increased DS use.34

The most frequently consumed DS were multivitamins followed by fish oil/omega 3, multivitamins with zinc, vitamin D, and workout supplements. These results are consistent with previous studies reporting the most common DS used in both military and civilian populations.14,19,30 From the 847 survey respondents who were found to consume DS, 601 (70.9%) reported taking 2 or more DS regularly. Furthermore, it is imperative to note that more than 100 different DS were reported by survey participants. The frequency of use coupled with the nu-
merous different DS consumed by this patient population reveals the need for comprehensive preoperative screening, medication reconciliation, and proper documentation to include DS.

In addition to the most commonly identified DS, it was noteworthy that marijuana was repeatedly reported as a supplement consumed to address a myriad of symptoms. Some of those symptoms included posttraumatic stress disorder, anxiety, decreased appetite, and pain. The use of marijuana was mainly reported by veterans in this study. Although complete confidentiality was assured to the participants, this herbal supplement may have been underreported because of the stigma its use has as an illegal substance in areas of the US and in the military.

The present study is the first, to our knowledge, to evaluate perioperative patients' understanding and knowledge base regarding DS. The results indicate that DS continue to be self-prescribed because only 6.49% of those who take DS reported their use to be prescribed by their healthcare professionals. Furthermore, 89.7% of patients taking DS reported having no knowledge of side effects from the DS they take, and an alarming 97.1% reported not knowing if the DS they currently take could interact with any of their prescribed medications. These findings are of grave concern in the surgical setting, especially when patients take DS that affect coagulation. Interestingly, 155 patients (18.3%) reported using 1 or more of the 9 different DS that are associated with increased bleeding or that potentially interfere with clotting (fish oil/omega-3, vitamin C, turmeric, garlic, green tea, ginseng, vitamin E, ginger, and curcumin).\(^{35,36}\) However, bleeding as a known potential side effect was reported only 4 times, or 2.6%, by the respondents, thus demonstrating a large knowledge deficit of potential side effects among DS consumers.

The reported lack of knowledge regarding side effects and interactions with prescribed medications from this study coupled with the result that 93.5% of respondents use DS that are not prescribed by their healthcare providers emphasizes the need for healthcare professionals to advise their patients to consult with their primary care providers before taking DS. After examining the demographics from this study, healthcare providers should not assume that only certain patients take DS. The authors recommend medical professionals make it a routine practice to ask every patient during preoperative interviews about their DS use and to ensure timely education. Such teaching could include an educational pamphlet that can be provided regarding DS use during the preoperative period. Furthermore, the knowledge deficit uncovered necessitates that healthcare professionals educate themselves regarding the potential harmful interactions and side effects of the most commonly used DS. Interestingly, earlier reports focusing on the knowledge base of Certified Registered Nurse Anesthetists (CRNAs) indicated that only 17% of 191 CRNAs interviewed felt confident about their knowledge of DS or herbal supplements and potential interactions and only 23% correctly identified the American Society of Anesthesiologists' recommendations to stop these supplements 2 weeks before surgery.\(^{37}\)

In the military healthcare system, not all patients receive anesthetic preoperative interviews before the day of surgery. Thus, the authors suggest that in military facilities, screening for DS use should be conducted by the scheduling surgical team before the day of surgery, instituting DS discontinuation guidelines.

Although this study provides the reader with salient data regarding DS consumers’ knowledge base and an update on the prevalence of DS use among military beneficiaries, limitations must be acknowledged. The self-reporting required to complete the survey proved to be challenging for some. For example, there were participants who could not recall the exact names of the DS they take, leading to underreporting. Additionally, some of the respondents were surveyed in the preoperative clinic days before their surgical date; others completed the survey during their preoperative evaluation on the same day of surgery, which might have limited the time to complete it and/or led to the participant feeling rushed or anxious and thus causing potential underreporting. Moreover, despite the confidentiality agreement, the patients completing the survey on the same day of surgery may have denied taking DS because of fear of their surgery being delayed or canceled. Furthermore, active-duty personnel may have underreported supplement use for fear of Uniform Code of Military Justice action resulting from taking DS not prescribed by a military physician.

Last, the investigators would like to disclose that the initial title of this study and of the survey presented to the participants was “Knowledge Assessment of Military Personnel, Veterans, and Family Taking Herbal Supplements.” An inclusion/exclusion criteria list or definition of herbal supplements was not provided to the participants to avoid influencing their responses. Therefore, after completion of the preliminary pilot data, we made the decision to collect all responses including the supplements that did not fit in the herbal supplement category. Consequently, the title of the study was modified to “Knowledge Assessment of Military Personnel, Veterans, and Family Taking Dietary Supplements,” reflecting a category encompassing all the different supplements reported.

**Conclusion**

This study is the first known reported descriptive cross-sectional study investigating surgical patients’ use and knowledge of DS in the military beneficiary and VA populations. These results provide medical professionals with salient data indicating that the prevalence of military beneficiaries and VA patients taking DS continues to be
high. Furthermore, results reveal that most of these patients lack knowledge regarding side effects and potential interactions. Additionally, we should understand that numerous DS are being used by our patients, and we should identify and investigate each reported supplement for possible interactions and side effects. Continued research regarding the side effects and interactions between DS and prescribed medication is strongly encouraged.

The findings in this study emphasize the need for not only patient education but also provider education regarding DS, their side effects, and their potential interactions. The creation of patient education materials may be beneficial to enhance patient learning during preoperative appointments and consequently decrease the surgical morbidity and mortality associated with certain DS. Future studies evaluating the DS knowledge base of healthcare professionals should include anesthesiologists, surgeons, surgery case managers, and all other healthcare providers responsible for educating the surgical patient. Furthermore, future exploration of the extensive demographic data collected in this study may aid in identifying predictors of patients likely to consume DS preoperatively.

REFERENCES


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