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Dietary Supplement Adverse Event Reporting and Coding at Keesler Medical Center

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Abstract

Background: Military members use dietary supplements (DS) more frequently than civilian adults and are at higher risk for adverse events. Literature suggests that health care providers lack knowledge on how and where to report DS adverse events. The Food and Drug Administration (FDA) relies on adverse event reports to monitor supplement safety and remove potentially harmful DS from the market.

Purpose: The purpose of this Doctor of Nursing Practice (DNP) project was to assess current DS adverse event reporting and coding practices at Keesler Medical Center (KMC) and identify and address knowledge deficits regarding reporting adverse events.

Project Design: The Knowledge to Action model was the organizing framework for this DNP project. Team members collected data from ICD-10 code queries, Natural MedWatch queries, and a data collection tool distributed to adult primary care providers. An educational intervention was developed and presented to KMC staff.

Results: Of 20 providers surveyed, 55% indicated encountering DS adverse events in their practice. However, three indicated knowledge of appropriate reporting practices. A query of ICD-10 codes resulted in 14 occurrences of recognized DS adverse events from October 2015-October 2017. No Natural MedWatch reports could be matched with the ICD-10 code event dates.

Organizational Impact/Implications for Practice: Consistent with previous literature, KMC providers identified a lack of knowledge on where and how to report DS adverse events. The educational intervention presented to personnel at KMC addressed that knowledge gap. Training on reporting adverse events related to DS use should be implemented annually throughout USAF Military Treatment Facilities (MTFs) in accordance with Air Force Instruction (AFI) 40-104.

Improving health care provider knowledge on how and where to report DS adverse events can positively impact the health of U.S. military forces by alerting the DoD and FDA to potentially dangerous supplements.

Dietary Supplement Adverse Event Reporting and Coding at Keesler Medical Center

Dietary supplements (DS) can range from single vitamin and mineral preparations to complex, multi-ingredient formulas. The DS industry in the United States (US) is a multi-billion-dollar industry with current revenues of \$31 billion and expected to grow (IBISWorld, 2017). The 2013-2014 National Health and Nutrition Examination Survey (NHANES) reported that over half (54%) of the US population used at least one DS in the past 30-day period (Center for Disease Control & Prevention, 2017). Most American adults who use DS report their primary reason for use as ‘improving or maintaining overall health’ (Bailey *et al.*, 2011). Reasons cited for DS use among military personnel also include ‘improving or maintaining health’, as well as ‘increasing energy’, ‘attaining greater muscle strength’, ‘performance enhancement’, ‘increasing endurance’, and ‘weight loss’; these latter reasons for use occur in much higher proportions in military populations versus civilian populations (Austin *et al.*, 2015; Austin *et al.*, 2016; Austin *et al.*, 2016; Lieberman *et al.*, 2010).

Dietary supplement use rates are higher among military populations (50-70%) when compared to their civilian counterparts (Austin *et al.*, 2015; Austin *et al.*, 2016; Austin *et al.*, 2016; Lieberman *et al.*, 2010). Military personnel represent a uniquely vulnerable population due to their occupational exposure to extreme temperatures and austere environments. These factors may conspire to put military members at higher risk of serious DS adverse events potentially affecting readiness and battlefield performance. Despite wide acceptance among military and civilian populations, few DS have undergone rigorous ingredient composition testing or demonstrated consistent evidence for supporting claims of purported efficacy or safety.

Compared to their role in regulating prescription medications, the Food & Drug Administration (FDA) has limited oversight on DS. As an example, product safety and efficacy

do not fall under the purview of the FDA (FDA, 2017). Instead, the FDA relies on adverse event reports from consumers, healthcare providers, and manufacturers to remove problematic DS. The Dietary Supplement Health and Education Act of 1994 (DSHEA) (FDA, 2016) governs DS regulation. This act sets guidelines on the safety and labeling of DS, requiring manufacturers to comply with Good Manufacturing Practices (GMP) before manufacturing and distributing a given supplement. Compliance with GMP is assumed unless a reason, such as DS adverse event reports warrant further investigation or an audit by the FDA (IOM, 2008). Manufacturers wishing to market new products must notify the FDA their intent (IOM, 2008), if the product contains a novel ingredient not marketed before 15 October 1994 (FDA, 2016).

The FDA relies on a post-market surveillance system to identify potentially dangerous DS (FDA, 2017). Reports of serious adverse events are mandated from industry (manufacturers, packers, and distributors) using either the MedWatch adverse event report form (Form FDA 3500A) or the online FDA Safety Reporting Portal (FDA, 2013). The FDA additionally relies on post-market voluntary adverse event reporting by healthcare providers and consumers (FDA, 2013). Estimates are that fewer than 1% of all DS adverse events are reported to the FDA (Woo, 2007). Despite low reporting rates, adverse event reporting remains integral to surveillance and provides the FDA with one of the few means by which it can identify and further investigate potentially harmful products.

The consequence of adverse event underreporting allows potentially harmful products to remain on the market. Retrospective analysis from the National Poison Data System demonstrated a marked increase of DS exposures from 2000 to 2012 (Rao *et al.*, 2017). Analysis of 10-years of nationally representative emergency room surveillance data found approximately 23,000 emergency room visits per year related to DS adverse events (Gellar *et al.*, 2015). The

increased use of DS paired with a lack of reporting DS adverse events creates a public health issue.

Significance of the Problem

Adverse events from DS use can range from minor to life-threatening. DS marketed for weight loss, or enhanced performance are associated with higher/highest rates of adverse events than other supplements (Geller *et al.*, 2015). The use of these risky supplements at higher rates among military members poses a threat to the health and readiness of military forces. Multiple case reports describe injuries and serious adverse events suffered by active duty service members as a result of DS use (Operation Supplement Safety (OPSS), 2017). One example involved a healthy 25-year old active duty service member who suffered a hemorrhagic stroke after using Animal Rage XL; a supplement marketed to boost performance during exercise (Harris *et al.*, 2017).

The Institute of Medicine's (IOM) review of DS use in military personnel emphasized the importance of post-marketing safety information and data collection through the FDA's MedWatch system (IOM, 2008). Recommendations from this report include a centralized monitoring system for reporting DS adverse events, and integration of this data within an electronic health record (IOM, 2008). The Department of Defense (DoD) has taken steps to mitigate risks to service members and beneficiary populations through multiple avenues including the development of the educational platform Operation Supplement Safety (OPSS), partnering with the Natural Medicines database to launch Natural MedWatch, and providing free access to Natural Medicines database to anyone with a .mil email address . The US Air Force (USAF) also recognizes the need to monitor adverse events in the population and mandates the reporting of DS adverse events in Air Force Instruction (AFI) 44-102 (USAF, 2015).

Additionally, AFI 40-104 requires annual training for USAF healthcare professionals regarding DS adverse event reporting (USAF, 2014).

In a survey of 311 Sports Medicine physicians, 71% of respondents had identified adverse events associated with DS use among their patients, but only eight individuals (~3%) reported through the FDA/Natural MedWatch (Pascale *et al.*, 2016). A similar survey of Uniformed Services University (USU) physician alumni as well as other healthcare providers who accessed the Natural Medicines Comprehensive Database (NMCD) noted 58% of the USU physicians and 35% of the NMCD respondents had encountered patients with possible DS adverse events (Cellini *et al.*, 2012). Despite the high rates of identified adverse events, adverse event reporting was much lower; 16% of USU physicians and 20% of NMCD respondents, respectively, reported the adverse events (Cellini *et al.*, 2012). However, only 3 NMCD respondents reported the suspected adverse event to the FDA, while the majority (~77%) reported the suspected adverse event to either the hospital pharmacy or military command.

The most common DS adverse event reported by military members includes abnormal heartbeats, tremors, stomach pain, dizziness, and numbness/tingling (Austin, 2015; Knapik *et al.*, 2016). In self-reports by Navy and Marine Corps active duty service members, 22% reported an adverse event related to the use of DS (Knapik *et al.*, 2016). Combination products, prohormones, and herbals are most commonly associated with adverse events (Knapik *et al.*, 2016). These DS are commonly marketed for performance enhancement, increasing energy, and weight loss. The use of dangerous DS by military personnel can negatively impact mission readiness and the overall health of the force. Reporting adverse events is key to providing the data necessary to alert the FDA and the DoD of potentially dangerous DS so that they may take steps to remove these products from the market.

Relevance to Military Nursing

The use of DS is higher among military service members than among the general public (Austin *et al.*, 2015; Austin *et al.*, 2016; Austin *et al.*, 2016; Knapik *et al.*, 2014). The rates among all branches of service ranged from 55%-76% (Austin *et al.*, 2015; Austin *et al.*, 2016; Austin *et al.*, 2016; Knapik *et al.*, 2014). The Navy, Marine Corps, and Coast Guard had the highest use rates with over 70% of survey respondents endorsing the weekly use of DS (Knapik *et al.*, 2016; Austin *et al.*, 2015). DS use among USAF respondents was reported as 68% (Austin *et al.*, 2016). Special Forces personnel are a subpopulation with even higher DS use; a prevalence rate up to 25% higher than rank-and-file soldiers (Lieberman *et al.*, 2010). Military personnel additionally have a higher likelihood of working in extreme temperatures and austere environments, which could predispose them to higher rates of DS adverse events (IOM, 2008).

Military personnel demonstrate a higher propensity for DS use and are therefore at increased risk of adverse events (Austin *et al.*, 2015; Austin *et al.*, 2016; Austin *et al.*, 2016; Knapik *et al.*, 2014). Of particular concern, military service members use more weight-loss and performance-enhancing supplements which are associated with higher rates of adverse events (Austin *et al.*, 2015; Austin *et al.*, 2016; Austin *et al.*, 2016; Knapik *et al.*, 2014, Knapik *et al.*, 2016; Lieberman *et al.*, 2010). As previously noted, military members most commonly reported DS adverse events of abnormal heartbeats, tremors, stomach pain, dizziness, and numbness/tingling (Austin *et al.*, 2015; Knapik *et al.*, 2016). In self-reports by Navy & Marine Corps active duty service members, 22% reported an adverse event related to the use of DS (Knapik *et al.*, 2016). DS taken with the intent of heightening performance to keep pace with high-operational tempos may jeopardize mission readiness and capability. In both stateside and deployed settings, military members using DS have suffered adverse events including acute

kidney injury, allergic reactions, and heat-related illnesses (OPSS, 2017). Finally, DS may be adulterated with substances that are prohibited for use by military members (Vorce *et al.*, 2011), leading to unwanted urinalysis test results and disqualification from service.

Clinical Question

In adult health care providers at Keesler Medical Center, does a targeted educational intervention regarding how and where to report dietary supplement adverse events improve reporting compliance in accordance with AFI 44-102?

Organizing Framework

The Knowledge to Action (KTA) Model (Graham *et al.*, as cited in White, 2012) was used as the framework for this DNP project. The KTA model conceptualizes knowledge traveling through a funnel where new knowledge is identified and integrated into clinical use (White, 2012). See Appendix A for a visual representation of the model and key components. The KTA model is an appropriate framework for integrating knowledge regarding DS adverse event reporting into clinical practice.

Project Design

The proposed DNP project is a quality improvement (QI) initiative. Team members developed and implemented an educational intervention designed to improve DS adverse event reporting at Keesler Medical Center.

Procedural Steps The DNP project followed the Knowledge to Action (KTA) Model framework for knowledge integration at Keesler Medical Center (KMC) (Graham *et al.* as cited in White, 2012). The KTA Model includes seven phases in the knowledge translation process (White, 2012). The first phase involves identifying a problem that needs to be addressed or reviewed and selecting research relevant to the problem. The problem identified in this DNP project involved

the discrepancy between the number of adverse events resulting from DS use and the number of adverse events reported. The second phase was to adapt the knowledge to the local context. The local context was identified through analysis of the setting of KMC and through a data collection tool administered to health care providers in the identified clinics. Current practice was further identified by a search of previous adverse event coding in Composite Healthcare System (CHCS) and the Natural MedWatch database. The third phase involved assessing barriers to knowledge use. The barriers to adverse event reporting were explored through the data collection tool given to local health care providers in identified clinics. The fourth phase was to select, tailor, and implement interventions to promote the use of the knowledge. The DNP project team produced an educational intervention targeting healthcare providers most likely to identify adverse events. The project also provided education on effective coding for the Electronic Health Record (EHR), and information on using resources available through OPSS. The fifth phase was monitoring knowledge use. Two additional aims for this project were to monitor for proper coding in Armed Forces Health Longitudinal Technology Application (AHLTA) over time, and the sixth phase was to evaluate outcomes of the educational intervention. Due to time constraints, the team was unable to perform these two phases. The final phase is sustaining knowledge use. The final phases of the KTA were beyond the scope of this project and will be recommended for future DNP projects or QI initiatives.

Methods

Setting The setting of this DNP project is the medical treatment facility (MTF), 81st Medical Group (MDG), at Keesler Air Force Base (AFB) in Biloxi, Mississippi. Keesler Medical Center is a robust military health care facility caring for over 27,000 beneficiaries that include 7500 active duty members (Department of Health Affairs, n.d.). The host unit of Keesler AFB is the

81st Training Wing. The installation is also home to the 2nd Air Force, the 403rd Wing, the 85th Engineering Installation Squadron (IES), and the Mathies NCO Academy. A busy training base with a diverse population, Keesler training programs manage more than 28,000 students annually. Training courses span 37 career fields and include Special Forces training programs such as Combat Controllers, Para-rescue, and Special Operations Weathermen. Students from each military branch as well as civilian federal agencies attend training at Keesler AFB.

Definitions Dietary supplements as defined by the FDA include products “‘intended to supplement the diet; contains one or more dietary ingredients (including vitamins, minerals, herbs or other botanicals, amino acids, and other substances) or their constituents; is intended to be taken by mouth as a pill, capsule, tablet, or liquid; and is labeled on the front panel as being a dietary supplement’ per the Dietary Supplement Health and Education Act of 1994 (National Institutes of Health, 2011). DS adverse events include ‘any undesirable experience associated with the use of a medical product in a patient’ (FDA, 2016). An adverse event is considered serious and should be reported to the FDA when the patient outcome is ‘death, life-threatening, requires hospitalization, results in disability or permanent damage, is suspected in a congenital anomaly or birth defect, requires intervention to prevent permanent impairment, or is considered an “important medical event”’ (FDA, 2016). Third Party Certification occurs when an independent organization tests a DS’s ingredients, verifying the quality and evaluating for purity, potency, composition, and other criteria (Akabas *et al.*, 2016). Manufacturers pay these companies to evaluate their products and participation is voluntary (Akabas *et al.*, 2016). The certification is a one –time snapshot of a given product and does not necessarily ensure future quality (OPSS, 2014). To maintain third-party certification status, most DS are tested annually, except for DS Certified for Sport by NSF International, which tests each lot individually (Akabas

et al., 2016). The most common third-party certification entities include ConsumerLab.com, NSF International, United States Pharmacopeia, Informed-Choice, and the Banned Substances Control Group (OPSS, 2014). Third-party certification does not endorse safety or efficacy of the product.

IRB The project was deemed to require full Institutional Review Board (IRB) oversight and the project proposal was submitted to the IRB at the at the 81st Medical Group (Keesler) (see Appendix B). Approval from the Keesler IRB was granted with a change to one of the data inputs. The initial proposal included a query of Patient Safety Reports (PSRs), an internal organizational reporting tool. A preliminary independent query by the IRB with the Patient Safety Office netted zero PSRs relevant to the project proposal, and it was suggested that the team members modify the proposal to omit PSR data collection (Siangco, personal communication, 17 Nov 2017). Team members additionally submitted the project abstract, project timeline, and USUHS Form 3202N to the Uniformed Services University (USU) IRB (see Appendix C). Project approval was granted; there were no recommendations for changes.

HIPAA Concerns No personally identifiable information (PII) was collected during this project. The ICD-10 codes were collected without PII /PHI included. Natural MedWatch data from OPSS did not include PII/PHI. Health care provider demographic information from the provider data collection tool was limited to credentials, gender, age range, clinical work center, and percentage of time spent in direct patient care.

Focus Areas The project had three aims: 1) to describe the current state of DS adverse event reporting at KMC; 2) to create an educational intervention to address gaps in knowledge regarding DS adverse event reporting and coding; 3) to determine if an educational intervention improves DS adverse event reporting.

Aim 1. To describe the current state of reporting of DS adverse events at KMC, team members gathered baseline data on three distinct data points 1) a query of ICD-10 codes pertinent to DS adverse events through M2/CHCS, a portion of the USAF's EHR, 2) a query of the Natural MedWatch reports involving military personnel, and 3) responses to a locally distributed provider data collection tool.

Part 1. ICD-10 codes for DS adverse events were determined with information gathered from the OPSS website as well as through collaboration with Dr. Jonathan Scott, Assistant Professor at Uniformed Services University (USU) and Ms. Tamara Brown, a medical coder at KMC (see Appendix D). These codes correspond to specific categories of DS. A Group Practice Manager (GPM) accomplished the ICD-10 code query on 07 Nov 2017 (A. Belvo, personal communication, 12 Mar 2018). No PII or personal health information (PHI) was collected during this query. Team members reviewed the event dates and tallied the number of occurrences of the specified ICD-10 codes (see Appendix E).

Part 2. Under the Freedom of Information Act (FOIA), a request was submitted to the FDA requesting the number of reports made to its Natural MedWatch post-market DS adverse event reporting website. The request specifically asked for any reports generated in the state of Mississippi from October 2015 to October 2017. The information request was acknowledged. However, at the date of submission, this information remains unavailable.

Access to Natural MedWatch data was unexpectedly obtained through Dr. Jonathan Scott, a DNP project committee member who is an Assistant Professor with the USU Department of Military and Emergency Medicine and a member of the Consortium for Health and Military Performance (CHAMP) (J. Scott, personal communication, 21 Sept 2017). The Natural MedWatch data included adverse event reports involving only military members from

2010 to 2017. Team members reviewed, coded, and organized the data looking for any reports that occurred during the time frame of October 2015 to October 2017, and originated from KMC.

Part 3. The provider data collection tool utilized in this project is an open source document, and therefore direct permission to use and modify the tool was not required. The tool was developed and utilized by Cellini *et al.* (2012) and was later modified by Pascale *et al.* (2016). Team members further modified the tool for use in this project (see Appendix F). The project specifically sought out clinical areas that were most likely to offer primary care services to adult populations (≥ 18 yrs). The consensus among team members led to the inclusion of the Family Health Clinic, Internal Medicine Clinic, Trainee Health Clinic, Women's Health Clinic, and the Emergency Department. The provider data collection tool was intended to be completed by physicians, physician assistants, and nurse practitioners working in these areas.

A paper format of the provider data collection tool was distributed to a point-of-contact in each of the respective clinical areas. Forty-one surveys were distributed to the following clinics: Family Health (12), Women's Health (8), Internal Medicine (8), Trainee Health (3) and the Emergency Department (10). The Family Health Clinic employs 14 providers including three medical doctors (MD), two doctors of osteopathy (DO), four family nurse practitioners (FNP), and five physician assistants (PA). All providers are military except one civilian FNP. The Women's Health clinic employs five obstetrician-gynecologists (OB/GYN) and one nurse midwife. Four of the OB/GYN physicians are military, one is civilian, and the nurse-midwife is military. Internal Medicine employs 11 active duty military MDs. The Trainee Health Clinic employs one military PA. The Emergency Department staffs ten MDs and one PA, all of whom are military.

Two-weeks after the initial distribution, a team member sent a reminder email to the points of contact. Few recipients, however, received the emails owing to technical and timing issues. At four weeks after initial distribution team members visited the points of contact providing an in-person reminder. At six weeks all completed (20) and incomplete surveys were collected from the clinical areas. Team members tallied all responses and then used descriptive statistics to characterize the data.

Aim 2. Analysis of the data provided by the collection tool revealed a knowledge deficit on DS adverse event reporting, specifically how and where to report. Respondents also indicated they were unfamiliar with third-party certification and this information was included in the educational intervention. The second aim of this project was to create an educational intervention to address knowledge deficits regarding DS adverse event reporting; secondary gain from this intervention assists KMC in meeting annual training requirements for DS adverse event reporting and potentially increases compliance with AFI 40-104. AFI44-102 requires healthcare providers to ‘document and report any adverse event that they believe may be associated with DS (USAF, 2015, p. 36). The team members created a 15-minute face-to-face PowerPoint presentation. The presentation combined reporting trends and practices from current literature, data assessing reporting practices at KMC, and resources specific to healthcare providers operating in a military environment. The educational intervention population included all privileged providers at KMC.

Aim 3. To fulfill the third aim of the project team members planned to conduct a post-intervention data query and analysis utilizing the same pre-intervention data inputs, ICD-10 codes and Natural MedWatch reports, to assess for change in DS adverse event reporting. However, time limitations precluded this final data collection. However it was deemed by the project mentor team that the project fulfilled the requirements of a full DNP project.

Project Results

The DNP project sought to examine DS adverse event reporting at KMC. We assessed for encounters at KMC involving DS adverse events through a query of ICD-10 codes for all outpatient and emergency room visits over a two-year period (October 2015 - October 2017). Those results were then compared to adverse event reports from Natural MedWatch assessing for correlation with ICD-10 event dates. Finally, provider knowledge and reporting practices were assessed through a local survey. Results from this project indicate a lack of DS adverse event reporting at KMC and implicate provider knowledge deficit as a contributing factor.

Aim 1 Results The M2/CHCS system query identified 14 occurrences of codes corresponding to DS adverse events over a two-year period. Appendix G provides a table detailing the ICD-10 codes used and the number of events. The most commonly occurring code was T50.995 (adverse effects of drugs, medicaments, and biological substances); it was used nine times for initial encounters, and three times for subsequent encounters. Two other codes, T43.615 (adverse effects of caffeine supplements) and T45.2X5 (adverse effects of succinimides and oxazolidinediones), were each used once.

An initial review of Natural MedWatch data included 67 total reports of adverse events dating from 2010 to 2017. None of the adverse event reports occurred within the project's specified time frame (October 2015 to October 2017). Consequently, none of the reports corresponded with the event dates of the KMC ICD-10 code data.

Twenty completed provider data collection tools were tallied and reviewed for trends. Data were entered independently by two team members and verified for accuracy by the third team member. The respondents included physicians (14), physician assistants (2), and nurse practitioners (4). Gender was equally distributed; males (11), females (9). The number of

providers spending more than 75% of their time in direct patient care was 17 with two providers spending between 25-50% and one provider <25%. The age ranges varied from 18-29 years (2), 30-39 years (17) and 40-49 years (1). The number of providers who had encountered a DS adverse event was 11; those who had not encountered an adverse event were six, and three providers were not sure if they had ever encountered an adverse event. The most common adverse events encountered included increased heart rate (10), heart palpitations (6), renal injury/failure (6), muscle cramps (5), and nausea (5). The most common serious adverse events encountered included renal injury/failure (6), rhabdomyolysis (5), and cardiac dysrhythmias (4). Three respondents indicated they knew where to report an adverse event; 14 did not know where to report, and three were unsure. Similarly, three respondents indicated they knew how to report adverse events; 15 did not know how to report, and two were unsure. Of the two respondents who indicated that they did report an adverse event when encountered, reports were made to Poison Control, another specialist, and other. Eleven respondents (55%) indicated they had received previous training on an overview of dietary supplements and ingredients, while only three respondents (15%) indicated they had received previous training on reporting adverse events associated with DS use. Fifteen respondents (75%) indicated they would benefit from additional educational opportunities about dietary supplements and adverse event reporting. Further data from the surveys will be held for five years for review if requested.

Aim 2 Results Utilizing data from the local provider data collection tool, team members generated a 15-minute PowerPoint presentation. The intervention's central purpose was to address provider knowledge deficit regarding DS adverse event reporting that had been identified through our local data collection tool results and supported by results from previous studies (Cellini *et al.*, 2012; Pascale *et al.*, 2016). The educational presentation included the role of the

FDA in DS regulation, the importance of adverse event reporting, the USAF requirement for providers to report DS adverse events, a list of relevant ICD-10 codes for medical record charting, screen captures of the OPSS website, and the Natural MedWatch online reporting form (see Appendix H). This educational intervention was given to six physician assistant students during a Lunch & Learn on 29 March 2018. Team members additionally presented the educational intervention at a meeting of Professional Staff on 19 April 2018. Eighty-one professional staff were in attendance.

Aim 3 Results The third aim of the project involved a proposed post-intervention data query and analysis utilizing the same pre-intervention data inputs, ICD-10 codes and Natural MedWatch reports, to assess for change and improvement in DS adverse event reporting at KMC. As previously mentioned, time limitations precluded this final data collection.

Discussion

The current state of DS adverse event reporting at KMC proved challenging to characterize. ICD-10 codes identified in the project's query included codes for the adverse effects of caffeine supplements (1 of 14), succinimides and oxazolidinediones (1 of 14), and the adverse effects of drugs, medicaments, and biological substances. The latter code is the most generic and occurred most often in our data query (12 out of 14 occurrences). Self-reported use of DS among military populations range from 73% (US Navy and US Marine Corps) (Knapik *et al.*, 2016) to 70% (US Coast Guard) (Austin *et al.*, 2015) to 68% (USAF) (Austin *et al.*, 2016), and 64% (US Army) (Austin *et al.*, 2016). Self-reported adverse events associated with DS use in a survey of 4400 Armed Forces personnel included abnormal heartbeats (7%), tremors (6%), stomach pain (5%), dizziness (3%), and numbness and tingling (3%) (Austin *et al.*, 2016); separately 22% of US Coast Guard DS users reported adverse events associated with DS use

(Austin *et al.*, 2015). Compared with NHANES survey data, in which 4% of the general national population of DS users reported adverse events associated with DS use (Timbo *et al.*, 2006), self-reported adverse events among military populations are considerably higher. Among the surveyed civilian population reporting DS-associated adverse events (4%), 48% sought medical care with a doctor, 25% reported the incident to a health authority, and 12% went to the emergency room (Timbo *et al.*, 2006). At KMC, a facility reporting 615 outpatient appointments and 100 emergency room visits daily and whose beneficiary population includes 8,500 active-duty military members, a higher rate of encounters involving DS adverse events might be expected (81st Training Wing Public Affairs, 22 February 2018).

DS products most prevalent among military populations include multivitamins/minerals (45-48%) (Austin *et al.*, 2015; Austin *et al.*, 2016), protein and amino acids (26-33%) (Austin *et al.*, 2015; Austin *et al.*, 2016; Austin *et al.*, 2016), individual vitamins/minerals, and combination products (22-24%) (Austin *et al.*, 2015; Austin *et al.*, 2016; Austin *et al.*, 2016). Only one of the ICD-10 codes in our data query reflects an adverse effect of the more commonly used DS products. Current ICD-10 code language for DS adverse events is not intuitive or clear for a provider attempting to choose the ICD-10 code which most appropriately reflects the DS product or products used by the patient (see Appendix D). The occurrence of the most generic DS adverse event ICD-10 code (T50.995) in this data set may be due in part to the lack of plain language for the end user. We also acknowledge that the ICD-10 codes may, in fact, be accurate and may be reflective of DS adverse events among patients who are not active duty. As the data query did not include any PII/PHI, we must interpret this with caution.

As previously mentioned, there were no Natural MedWatch adverse event reports that were generated between October 2015 and October 2017. The occurrence of DS adverse events,

as demonstrated by ICD-10 code occurrences, without correlating Natural MedWatch adverse event reports may be due to several factors. First, it is possible that Natural MedWatch reports were submitted, but that the patient on whom the report was submitted was not an active-duty military member. Our access to Natural MedWatch reports was limited to those reports involving military members. Second, it is possible that an adverse event report was made to different body or authority, such as a Poison Control Center or directly to the FDA. Third, it is possible that an adverse event report was not made due to a barrier, such as lack of time or a lack of knowledge. Finally, it is possible that no adverse event report was made due to a lack of awareness requiring providers at MTFs to submit a report. Of note, several of the Natural MedWatch reports which we reviewed contained incomplete information; there were similar findings with a prior study examining DS adverse event reporting (Gardiner *et al.*, 2008). Incomplete adverse event reports do little to aid DoD, and by extension the FDA, in identifying concerning or dangerous DS and taking steps to mitigate risk to military populations.

The results of our provider data collection tool demonstrated consistencies with earlier studies (Cellini *et al.*, 2013; Pascale *et al.*, 2016); similar percentages of self-reported knowledge deficits with where and how to report DS adverse events were notable. Adverse event reports made to entities other than Natural MedWatch or the FDA were also noted in a prior study (Gardiner *et al.*, 2008). Our results further reinforce low DS adverse event reporting mentioned by Woo (2007). The implication of this information is that DS adverse events are being encountered but are not being reported.

The self-reported lack of knowledge and training on DS adverse event reporting led us to hone in on this topic as the focus of our educational intervention. We were encouraged in proceeding with this focus as 75% of respondents indicated they would benefit from additional

educational opportunities about DS and adverse event reporting. As many respondents (70%) were not familiar with third-party verification, we decided to include information on this topic in our educational intervention as well.

Limitations

A literature review revealed several large-scale studies assessing the use of DS in US military populations, but limited studies on health care provider knowledge related to reporting DS adverse events (see Appendix J). The information is based on survey data and therefore respondents could be biased toward DS use falsely inflating the percentage of military personnel who use DS and altering the numbers of health care providers aware of DS adverse event reporting. Further, data obtained from health care provider knowledge was primarily physician-based and including other healthcare providers like Nurse Practitioners, Physician Assistants, Pharmacists, and Dietitians may change the results.

As previously mentioned, the ICD-10 code data did not reflect if the patient was active-duty military, retired military, or a military spouse or child. Only active-duty military personnel who were identified as such in a Natural MedWatch adverse event report would have been shared with OPSS. It is possible Natural MedWatch reports were submitted, but the individuals were not identified as current military members, and thus the data was not available through OPSS. In retrospect, we should have included questions in the local survey about the witnessed adverse event to include where the event occurred and if the patient was active duty military. Additional information would allow for more specific characterization of the DS adverse event reporting at KMC. Finally, due to time constraints, we were unable to complete the final arm of our DNP project, a post-intervention query of ICD-10 code data and Natural MedWatch data.

Organizational Impact/Implications to Practice & Policy

Again, USAF policy directs annual DS adverse event report training and DS adverse event reporting through Natural MedWatch (USAF, 2014; USAF, 2015). Anecdotally, in discussions with health care providers, many were unaware of this requirement. The educational intervention addressed the knowledge deficits identified in the local provider data collection tool, DS adverse event reporting process, and the reporting requirement for providers working in the Air Force Medical System (AFMS). It expanded on third-party certification and introduced a tool for discussing the safety of DS with patients. The educational intervention was advertised to KMC in an email announcement. Six physician assistant students attended the educational intervention on 29 March 2018 during a Lunch & Learn. Participants were given a one-page handout with Natural MedWatch web address, ICD-10 codes, and the OPSS web address (see Appendix I). We also presented the educational intervention to KMC professional staff during their monthly training day meeting on 19 April 2018. Approximately 81 credentialed healthcare providers attended the meeting from various clinics and specialties. During each session questions arose regarding 1) the third-party certification companies and who funds them, 2) lists of banned supplements [for military members], 3) the GNC store located at the shopping center on base and the supplements they sell. These questions stimulated discussion regarding third-party certification, banned substances, and AFI 40-104 that mandates responsibility for health promotion nutrition and dietary supplements. Ideally, the information will spread from health care providers and support staff to patients and their families increasing safe practices related to DS use.

Team members also presented a PowerPoint sharing the findings of our DNP project with KMC leadership in an executive meeting on 18 April 2018. Thus, alerting KMC leadership and

stakeholders on the importance of DS adverse event reporting and the results of the local survey demonstrating a knowledge deficit in those surveyed. Keesler Medical Center leadership are now aware of the AFI requirement for training and mandating reporting of adverse events through Natural MedWatch. Keesler Medical Center leadership expressed satisfaction with the presentation and after the meeting discussed including information from the educational intervention in new resident orientation material.

Future Directions for Research and Practice

Team members suggest further surveys of military personnel and all military beneficiaries to determine the use of DS and attitudes toward safety and efficacy. Team members further suggest inquiry regarding DS use and adverse events should be added to the annual periodic health assessment (PHA). Questions should include the type of supplement(s) used, the reason for use, and side effects. Personnel who are responsible for addressing PHA inputs should be adequately educated to address possibly unsafe DS practices.

The educational intervention has the potential to impact KMC positively and more broadly the USAF by addressing health care provider knowledge gap regarding where and how to report adverse events. The educational intervention helps meet the requirement set forth by the USAF in AFI 40-104 (2014). Annual education on DS adverse event reporting should be implemented in all USAF MTFs in accordance with the AFI 40-104. It is through adverse event reporting that the military can begin to identify unsafe DS and recommend changes accordingly. If DS adverse events are reported, the DoD can act to limit the use of these supplements via memorandums, policy, and interaction with local vendors.

Through this project, we identified a discrepancy between the mandate to alert Air Force Medical Operations Agency (AFMOA) of DS adverse events per AFI 44-102 and guidance on

what method to convey this information. Air Force Medical Operations Agency implemented the requirement for providers working in MTFs to report DS adverse events, however, clear guidance on how reporting should occur is lacking. Vague policy wording and lack of policy dissemination/advertisement are systemic factors potentially influencing DS adverse event reporting at KMC. Operation Supplement Safety distributes data on DS adverse events involving military personnel to the DoD which is then passed on to the specific Service (Scott, personal communication, 01 March 2018). We recommend AFMOA provide clear guidance on what avenue to send these reports and what information is most important to military health system (MHS) leadership. The DNP team intends to coordinate with KMC Information & Technology (IT) office to add the educational intervention to the KMC intranet page in May 2018. Allowing broad access to the educational intervention allows it to reach a larger, more diverse audience. We recommend future DNP projects or other quality improvement efforts include a data query from both KMC's ICD-10 codes and Natural MedWatch data at six or 12 months post-intervention to assess for changes in DS adverse event reporting at KMC. Finally, we recommend MHS adopt the ICD-10 code language within the electronic health record (EHR) suggested by OPSS. Clearer language will allow health care providers and coders to select the best code and potentially assist leadership in identifying problematic DS.

Conclusion

The local data collection at KMC is consistent with larger studies examining DS adverse event reporting practices and provider knowledge deficits. The educational intervention sought to improve provider knowledge regarding adverse event reporting at KMC. The DNP project timeline did not allow for follow up data collection and subsequent determination of efficacy of the educational intervention. To truly determine any practice or behavior change with providers

at KMC regarding DS adverse event reports, a post-intervention data collection would be completed at 6 and 12 months. Ongoing education regarding DS and adverse event reporting is directed by AFI and remains crucial for both the FDA and the DoD to identify potentially dangerous supplements and act to mitigate risk to both civilian and military populations.

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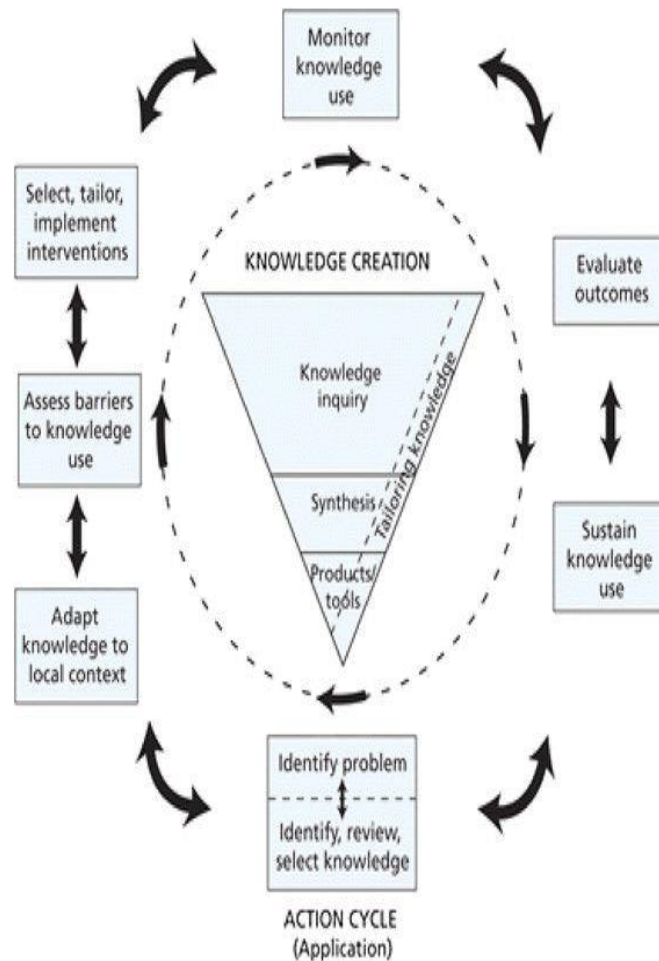
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Appendix A

Knowledge to Action Model



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Appendix B

Keesler IRB Documents



DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND
Federalwide Assurance # FWA00004447 / DoD Assurance of Compliance # 50003

30 November 2017

MEMORANDUM FOR 81 MDG/SGME (USUHS)
Attn: Maj Brian Kennedy

FROM: 81 MDSS/SGSE

SUBJECT: Initial Determination of Exempt Research Proposal

1. On 30 November 2017, your proposal entitled, "**Dietary Supplement Adverse Event Reporting at Keesler Medical Center**" was reviewed by Institutional Review Board member, Lt Col Amanda Siangco. Based on the information provided in the proposal and other proposal related documents, she determined that this study meets all the necessary criteria for an exemption and is hereby designated as "exempt" under 32 CFR 219, Section 101, (b), (2 & 4). Therefore you are now authorized to begin your study. The number assigned to your proposal is **FKE20180003E**. Please use this number as a reference in all correspondence to the Clinical Research Laboratory.
2. If you need to make any modifications to your study, you will need to submit an amendment form for review and approval before implementing. As always, you are responsible for complying with all required policies and procedures.
3. If you need funding in support of your research to procure supplies, you will need to submit a Request for Funding letter to the Director of the Clinical Research Laboratory. At no time are you authorized to procure supplies through channels other than the Clinical Research Laboratory.
4. If any manuscripts, abstracts, and/or posters will be submitted for publications or presentations, you will need to contact the CRL to obtain the paperwork to be completed and prepared for the required review and clearance.
5. As this study is designated as exempt no further oversight is required from our office unless you need to make an amendment to the study. There are no annual progress reports required for continuation and a final report for closure is not required. If you have any questions, please contact me at (228) 376-4917 or DSN 591-4917. Thank you.

[REDACTED]
RHONDA BLACKWELL, GS-08
IRB Protocol Coordinator
Keesler AFB MS

cc:
Protocol Folder

KEEP THIS LETTER ON FILE WITH YOUR OTHER STUDY RELATED DOCUMENTS.

Appendix C

USU IRB Documents



UNIFORMED SERVICES UNIVERSITY
of the Health Sciences

OFFICE OF RESEARCH

4301 JONES BRIDGE ROAD
BETHESDA, MARYLAND 20814
PHONE: (301) 295-3303; FAX: (301) 295-6771

NOTICE OF PROJECT APPROVAL

Change Number: Original

VPR Site Number: T0-GSN-61-9416-01
Principal Investigator: Hart, Marcie (GSN-61)
Department: Graduate School of Nursing
Project Type: Student
Project Title: Dietary Supplement Adverse Event Reporting & Coding at Keesler Medical Center
Project Period: 11/16/2017 to 11/15/2018

Assurance and Progress Report Information:

<u>Name</u>	<u>Sup</u>	<u>Approval Type</u>	<u>Status</u>	<u>Approved On</u>	<u>Forms Received</u>
Progress Report	0			To be Submitted	N/A

Remarks:

This Notice of Project Approval has been reviewed and approved. Please remember that you must submit a final Progress Report (Form 3210) upon completion of this project.

Questions regarding this approval should be directed to the following person in the Office of Research:
Ronda Dudley, (301) 295-9818.

Yvonne T. Maddox, Ph.D. Date
Vice President for Research
Uniformed Services University of the Health Sciences

cc: Hart, Marcie (GSN-61)
Vernell Shaw
File
Linda Wanzer

Appendix C

USUHS FORM 3202N DANIEL K. INOUE GRADUATE SCHOOL OF NURSING EVIDENCE-BASED PRACTICE/PERFORMANCE IMPROVEMENT PROPOSAL		VPR Date Stamp
Project Number: <u>TD 619416</u> (VPR #000000)		
Project Title: <u>Dietary Supplement Adverse Event Reporting and Coding at Keesler Medical Center</u>		
SECTION A: STUDENT POC INFORMATION		
1. Name (Last, First, MI): <u>Hart, Marcie K</u>		Student E-mail: <u>marcie.hart@usuhs.edu</u>
SECTION B: COMMITTEE CHAIR/SENIOR MENTOR INFORMATION		
3. Name (Last, First, MI): <u>Johnson, Heather</u>		
4. Telephone: <u>301-295-1089</u> Fax: <u>301-295-1707</u>		E-mail: <u>heather.johnson@usuhs.edu</u>
5. USUHS Building/ Room No.: <u>Building E, Room E1015</u>		
SECTION C: PROJECT INFORMATION		
6. Attach the Abstract for the proposal, including the following sections: Site Location of the Project, Title, Authors, Background or Problem/Issue, Clinical Question/Purpose, Project Design, Anticipated Organizational Impact/Implications for Practice and also include the Proposed Timeline. Single space the abstract and use Times New Roman font, size 12.		
7. Is this proposal related to an active research project of the Chair/Senior Mentor identified in Section B? ☐ Yes ☒ No If yes, complete below; if no, proceed to Part 8. Project Number: _____ Project Title: _____ Project Start Date: _____ Project End Date: _____		
8. Anticipated period of performance: Project Start Date: <u>5/1/2017</u> Project End Date: <u>5/15/2018</u>		
9. Performance Site(s): <u>Keesler Medical Center, Keesler Air Force Base, Biloxi MS</u>		
10. Does this project involve any classified information? (Contact the USUHS Security Office for guidance) ☐ Yes ☒ No		
11. Do you have a funding source for this project? ☐ Yes ☒ No ☐ NA If yes, specify the funding agency and the amount provided: _____		
SECTION D: SIGNATURES		
The following signatures attest to the validity of the above information:		
Associate Dean for Research, GSN	(Signature and Date)	Dean, ~~2015~~ Graduate School of Nursing (Signature and Date)
USUHS Vice President for Research	Date	
USUHS Form 3202N (VPR) - Revised Sep 2015 v1.2 Previous versions are obsolete		

Appendix C



Appendix I: Daniel K. Inouye Graduate School of Nursing
DNP Project Senior Mentor Approved Abstract/Impact Statement Form

DOCTOR OF NURSING PRACTICE PROJECT Senior Mentor Approved Abstract/Impact Statement Form

PROPOSAL ABSTRACT

Keesler AFB

Project Title: Dietary Supplement Adverse Event Reporting and Coding at Keesler AFB

Authors: Hart, M., Kennedy, B., & Stiltner, D.

Background or Problem/Issue: Adverse events from dietary supplement (DS) use can range from minor to life-threatening. DS marketed for weight loss, or performance enhancement are associated with higher rates of adverse events and are considered high risk. Military members report using these high-risk supplements more frequently than their civilian counterparts putting them at greater risk for adverse events. The FDA relies on adverse event reports (AER) to monitor supplement safety and removes potentially harmful DS from the market. The Air Force mandates education about supplement safety and adverse event reporting IAW AFI 44-102 and AFI 40-104. Without AERs, dangerous dietary supplements continue to be marketed, putting consumers at risk and in the military affecting military health and readiness.

Clinical Question or Purpose: In the adult, health care providers at Keesler Air Force Base (KAFB), does a targeted educational intervention regarding dietary supplement safety and adverse event reporting improve reporting?

Project Aims:

1. Describe the current state of reporting of dietary supplement adverse events at KAFB.
2. Create an educational intervention to address gaps in knowledge regarding AER
3. Determine if an educational intervention improves AER.

Project Design:

This descriptive quality improvement project seeks to improve the reporting of adverse events at KAFB.

Methods:

1. Describe the current states of DS AER at KAFB as evidenced by:
 - a. Descriptive data collected via Natural MedWatch.
 - b. ICD10 codes entered into AHLTA from October 1, 2015, date to October 1, 2017.
 - c. Reporting on 81st MDG safety reports
 - d. Current practice as reported by health care providers (HCP) who complete Dietary Supplements: Healthcare Professional Knowledge and Adverse Event Reporting data collection tool developed by the Consortium for Health and Military Performance (CHAMP).
2. Create an educational intervention to address gaps in knowledge regarding AER that includes:
 - a. Requirements outlined in AFI 40-104 and 44-102.
 - b. Share results from the data collection tool.
 - c. Creating an AE report via the Natural MedWatch website.

Appendix C



Appendix I: Daniel K. Inouye Graduate School of Nursing
DNP Project Senior Mentor Approved Abstract/Impact Statement Form

- d. Coding AE in AHLTA.
 - e. Addressing knowledge gaps uncovered via the data collection tool.
 - f. Providing additional resources for HCP about dietary supplements through the Human Performance Research Center (HPRC) Operation Supplement Safety (OPSS).
3. Determine if an educational intervention improves AER as evidenced by:
- a. Descriptive data collected via MedWatch from
 - b. ICD10 codes entered into AHLTA from 1 JAN 2018 to 1 MAR 2018.

Organizational Impact/Implications for Practice:

The project seeks to assess the state of DS AE reporting by providers at 81st MDG before and after a provider-targeted educational intervention. The objectives are:

1. Improve reporting of DS AE.
2. Improve health and readiness of military personnel.

APPROVED:

Heather L. Johnson
Senior Mentor (type name)



10/23/17
(Date)

Form Version: 4 Sept 2016

Appendix C

DNP Project Keesler AFB
Timeline

Project Year 1 2017												
Activity/Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
USUHS VPR Submission and Approval									X			
Site IRB Submission and Approval									X	X		
Project Planning						X	X	X				
Project Implementation/Data Collection									X	X	X	X
Data Analysis												
Dissemination												

Project Year 2 (2018)												
Activity/Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
USUHS VPR Submission and Approval												
Site IRB Submission and Approval												
Project Planning												
Project Implementation/Data Collection	X											
Data Analysis		X										
Dissemination			X	X								

Appendix D

DS Adverse Event ICD-10 Codes for EHR Query; Comparison of Current and Proposed Language

ICD-10 Codes for Dietary Supplement Adverse Events	
Adverse effects of: (Current Language)	Adverse effect of: (Proposed Language)
T50.995: Drugs, medicaments, and biological substances	T50.995: Herbals and other botanical supplements
T50.5X5: Appetite Depressants	T50.5X5: Weight Loss Supplements
T43.615: Caffeine Supplements	T43.615: Caffeine and other dietary stimulant-containing supplements
T45.2X5: Succinimides and Oxazolidinediones	T45.2X5: Vitamins and/or mineral supplements
T50.0X5: Mineralocorticoids and their antagonists	T50.0X5: Health Supplements (Joint, Heart, Brain, Gut health)
T50.4X5: Drugs affecting uric acid metabolism	T50.4X5: Protein Supplements (Protein, creatine, amino acids)
T50.7X5: Androgens and Anabolic Congeners	T50.7X5: Anabolic and/or Anabolic-like substances
T50.3X5: Electrolytic, caloric, and water-balance agents	T50.3X5: Sexual Enhancement
T50.1X5: Loop Diuretics	T50.1X5: Other types of supplements (unclear as to intended use and/or ingredients)

Appendix E

Event Dates of DS Adverse Events Identified by ICD-10 Code in Data Query of KMC's EHR

Event Date	ICD-10 Code
30 Mar 2017	T43.615A
15 Feb 2017	T50.995A
13 Feb 2017	T50.995A
08 Feb 2017	T50.995D
28 Jan 2017	T50.995A
05 Jan 2017	T45.2X5A
30 Dec 2016	T50.995D
29 Dec 2016	T50.995D
21 Dec 2016	T50.995A
22 Jul 2016	T50.995A
12 Jul 2016	T50.995A
24 Jun 2016	T50.995A
04 Apr 2016	T50.995A

Appendix F

Provider Data Collection Tool

Maj Brian Kennedy, Maj Denise Stiltner and Capt Marcie Hart are third year Doctor of Nursing Practice students in the Family Nurse Practitioner program. We are completing an evidence-based practice quality improvement project in partial fulfillment of program requirements. We request the participation of physicians, physician assistants, nurse practitioners and dietitians currently caring for patients at Keesler Air Force Base for the purpose of understanding practices surrounding dietary supplement adverse event reporting. Individual responses are confidential and no personally identifiable information will be collected. Participation is completely voluntary. You may opt out at any time. You do not have to answer any question that makes you uncomfortable. Should you elect to participate, please circle the answers to the questions below and return this document to the red folder or NCOIC. For any questions, please see the contact information listed below. Thank you so much for contributing to our project and we look forward to your responses.

Brian Kennedy, Maj, NC, USAF
Brian.kennedy@usuhs.edu
314-346-5204

Denise Stiltner, Maj, NC, USAF
Denise.stiltner@usuhs.edu
813-831-7799

This project received Keesler AFB and Uniformed Services University of the Health Sciences IRB approval.

Keesler IRB: FKE20180003E
USUHS IRB: T0-GSN-61-9416-01

Appendix F

Dietary Supplements: Healthcare Professional Knowledge and Adverse Event Reporting

1. I am
 - a. military
 - b. civilian
2. What is your gender?
 - a. Male
 - b. Female
 - c. Other
3. What is your age range?
 - a. 18-29 years
 - b. 30-39 years
 - c. 40-49 years
 - d. 50-59 years
 - e. >60 years
4. What is your current professional status? Circle all that apply.
 - a. Aerospace and undersea medicine
 - b. Athletic trainer
 - c. Chiropractor
 - d. Nurse
 - e. Nurse practitioner
 - f. Dietitian/Nutritionist
 - g. Pharmacist
 - h. Physical/occupational therapist
 - i. Physician assistant
 - j. Physician
 - k. Other (please specify): _____
5. What is your current primary clinical practice location?
 - a. Emergency Department
 - b. Family Practice Clinic
 - c. Internal Medicine
 - d. Women's Health
 - e. Other (please specify): _____

Patient Interaction

6. How much of your professional time do you spend providing direct patient care?
 - a. <25%

Appendix F

- b. 25-50%
- c. 50-75%
- d. >75%

7. Do you ask your patients about their use of dietary supplements?

- a. Routinely (go to 7a)
- b. Only if clinically indicated (go to 7a)
- c. I do not inquire about dietary supplements (skip to question 8)

7a. *If you answered (a) or (b) to question 7, for which of the following symptoms do you inquire about dietary supplements use? Circle all that apply.*

- a. Altered mental status
- b. Anxiety
- c. Cardiac dysrhythmia
- d. Cerebral hemorrhage
- e. Cramping
- f. Dizziness
- g. Fatigue
- h. Hallucinations
- i. Headaches
- j. Heat illness
- k. Heart palpitations
- l. Hepatic injury/failure
- m. Increased heart rate
- n. Metabolic derangements
- o. Myocardial infarction
- p. Muscle cramps
- q. Nausea
- r. Nervousness
- s. Nosebleeds
- t. Renal injury/failure
- u. Restlessness
- v. Rhabdomyolysis
- w. Seizures
- x. Syncope
- y. Sleep disturbances
- z. Other (please specify): _____

8. Please rate the following statement: "I feel confident answering patients' questions about dietary supplements."

- a. Strongly disagree
- b. Disagree
- c. Neither agree nor disagree

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- d. Agree
- e. Strongly agree

9. Do you have a reliable source for information about dietary supplements?

- a. Yes (go to 9a)
- b. No (skip to question 10)
- c. Unsure (skip to question 10)

9a. *If you answered (a) YES to question 9, select which source(s) you use. Circle all that apply.*

- a. Epocrates
- b. Lexicomp
- c. Clinical Key (formerly, MD Consult)
- d. Micromedex
- e. Natural Standard/Natural Medicines Comprehensive Database
- f. Poison Control Center
- g. PubMed/MEDLINE
- h. Up to Date
- i. Other (please specify): _____

10. Companies such as United States Pharmacopeia (USP), NSF International, Informed-Choice, and ConsumerLab.com have programs that evaluate dietary supplements for quality. How familiar are you with these third-party verification programs?

- a. Not familiar
- b. Moderately familiar
- c. Very familiar

11. What are some benefits your patients report from using dietary supplements? Circle all that apply.

- a. Not applicable. I do not discuss dietary supplement use with my patients.
- b. Improved overall health
- c. Improved mental health
- d. Improved cognitive function (memory and concentration)
- e. Improved physical performance
- f. Increased muscle mass
- g. Weight loss
- h. Other (please specify): _____

Adverse Events

12. Do you know where to report adverse events/reactions associated with dietary supplement use?

- a. Yes
- b. No
- c. Unsure.

Appendix F

13. Do you know how to report adverse events/reactions associated with dietary supplement use?

- a. Yes
- b. No
- c. Unsure

14. Have you ever encountered an adverse event/reaction in a patient that might be associated with dietary supplement use?

- a. Yes (go to 14a)
- b. No
- c. Unsure

If you answered (a) YES to question 14, please answer questions 14a, 14b, and 14c

14a. What are some common adverse events/reactions you have seen? Circle all that apply.

- a. Altered mental status
- b. Anxiety
- c. Cardiac dysrhythmia
- d. Cerebral hemorrhage
- e. Cramping
- f. Dizziness
- g. Fatigue
- h. Hallucinations
- i. Headaches
- j. Heat illness
- k. Heart palpitations
- l. Hepatic injury/failure
- m. Increased heart rate
- n. Metabolic derangements
- o. Myocardial infarction
- p. Muscle cramps
- q. Nausea
- r. Nervousness
- s. Nosebleeds
- t. Renal injury/failure
- u. Restlessness
- v. Rhabdomyolysis
- w. Seizures
- x. Sleep disturbances
- y. Syncope
- z. Other (please specify): _____

14b. What are some of the most serious/severe adverse events/reactions you have seen? Circle all that apply.

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- a. Altered mental status
- b. Anxiety
- c. Cardiac dysrhythmia
- d. Cerebral hemorrhage
- e. Hallucinations
- f. Heat illness
- g. Heart palpitations
- h. Hepatic injury/failure
- i. Increased heart rate
- j. Metabolic derangements
- k. Myocardial infarction
- l. Renal injury/failure
- m. Rhabdomyolysis
- n. Seizures
- o. Syncope
- p. Trouble falling asleep
- q. Trouble staying asleep
- r. Other (please specify): _____

14c. Did you report any of the adverse events that you encountered?

- a. Yes
- b. No
- c. Unsure

If you answered (a) YES to question 14c, please answer questions 14d, 14e, 14f, and 14g.

14d. Where did you report the adverse event(s)? Circle all that apply.

- a. Another specialist
- b. FDA/MedWatch
- c. Hospital database
- d. Natural Medicine Watch
- e. Poison Control
- f. Supplement Company
- g. Other (please specify): _____

14e. How much time did you spend reporting the adverse event(s)?

- a. <10 minutes
- b. 10 to 15 minutes
- c. >15 minutes

14f. How would you describe the process of reporting? Circle all that apply.

- a. Cumbersome
- b. Convenient
- c. Easy

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- d. Difficult
- e. Intuitive
- f. Confusing

14g. What ICD 10 code did you use to document the dietary supplement adverse event during the patient encounter?

14h. *If you answered (b) NO to question 14c*, and did not report a possible adverse event in a patient, why not? Circle all that apply.

- a. Did not know where to report
- b. Process takes too long
- c. Did not know procedure for reporting
- d. Other (please specify): _____

Supplement Types

15. What types and/or product names of supplements do you encounter the most?

16. What types and/or product names of supplements are you most concerned about?

Education

17. Which of the following topics have you received training on? Circle all that apply.

- a. Overview of dietary supplements and supplement ingredients
- b. Evaluation of dietary supplement use during patient encounters
- c. Counseling patients on appropriate selection and use of dietary supplements
- d. Reporting of adverse events associated with dietary supplement use
- e. Other. Specify: _____

18. When was your most recent training on the topics listed above?

- a. Less than one year ago
- b. One year to less than two years ago
- c. Two to less than three years ago
- d. Three or more years ago
- e. I have never received training on dietary supplements

19. Would you benefit from additional educational opportunities about dietary supplements and adverse event reporting on dietary supplements?

Appendix F

- a. Yes
- b. No
- c. Unsure

Appendix G

DS Adverse Event ICD-10 Code Occurrences at KMC (October2015- October 2017)

ICD-10 Code	Number of Occurrences
T50.995A (Adverse effects of drugs, medicaments, and biological supplements/herbals and other botanical supplements; initial encounter)	9
T50.995D (Adverse effects of drugs, medicaments, and biological supplements/herbals and other botanical supplements; subsequent encounter)	3
T43.615A (Adverse effects of caffeine supplements/caffeine and other dietary stimulant containing supplements; initial encounter)	1
T45.2X5A (Adverse effects of succinimides and oxazolidinediones/vitamins and/or mineral supplements; initial encounter)	1

Appendix H

Educational Intervention (PowerPoint slides)

Dietary Supplement Adverse Event Reporting



Maj Denise Stiltner, Maj Brian Kennedy, Capt Marcie Hart
Family Nurse Practitioner, Doctor of Nursing Practice Students

DNP Project Committee Members:

Dr. Heather Johnson, Dr. Jonathan Scott, &

Dr. Jennifer Varney

USU PROJECT# TO619416

KEESLER IRB#: FKE20180003E



<http://www.nbc.com/saturday-night-live/video/pumping-up-with-hans-andamp-franz/n9619?snl=1>



Appendix H

Outline

- Introduction/background information
- Local Survey Results
- How-to-Guide for Reporting
- Third-Party Certification
- Resources (ICD-10 codes, Operation Supplement Safety-OPSS, Natural Medicines Database, etc.)



Introduction

- Service members- high rates of dietary supplement use
- AFI 44-102: requires dietary supplement adverse event reporting through Natural MedWatch
- Reporting adverse events alerts the FDA to potentially dangerous supplements



<http://www.af.mil/News/ArticleDisplay/article/118534/air-force-officials-emphasize-individual-fitness-responsibility/>



(Austin et al., 2015; Austin et al., 2015; Austin et al., 2016; Knapik et al., 2014, Knapik et al., 2015; Knapik et al., 2016; Lieberman et al., 2010; IOM, 2009; USAF, 2015)



Appendix H

Role of the FDA

- “FDA is not authorized to review dietary supplement products for safety and effectiveness before they are marketed per the Dietary Supplement Health and Education Act (DSHEA) of 1994” (FDA, 2017)
- Reliance on post-market surveillance
- Importance of reporting



(Pascale et al., 2016; FDA, 2017)



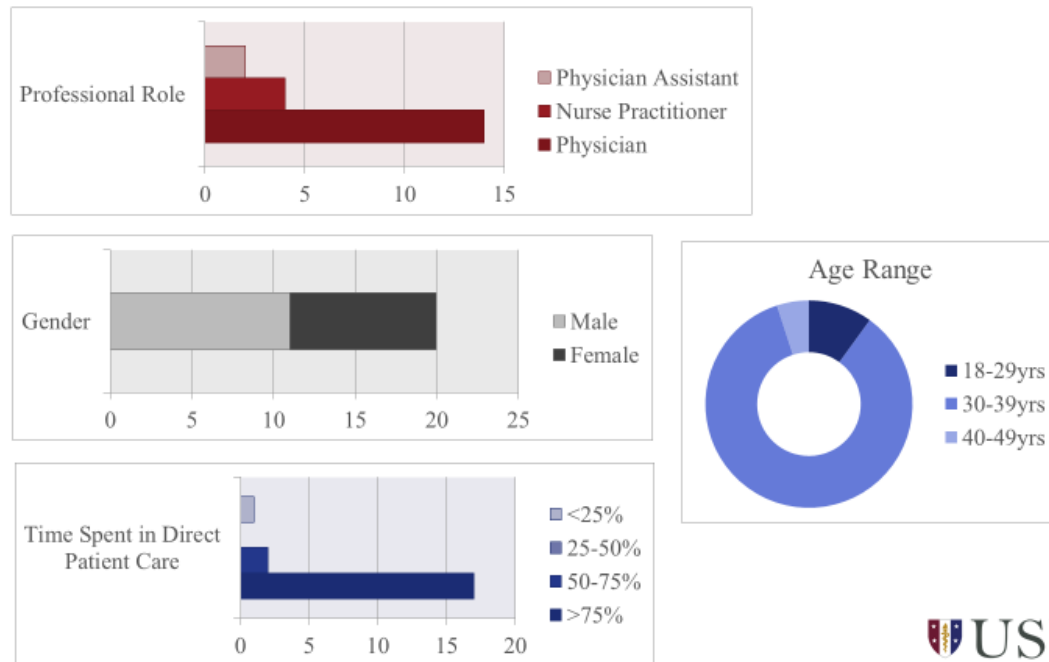
Brief Description of Survey

- Keesler data collection tool
 - Modified version of American Medical Society for Sports Medicine (AMSSM) Adverse Event Reporting Questionnaire developed by Pascale et al., 2016.
 - n=311
 - 20 physicians, PAs, and NPs completed paper survey

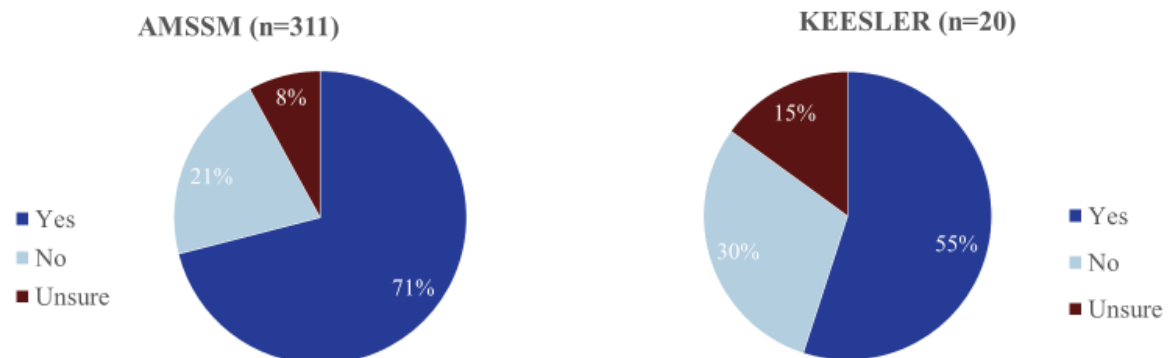


Appendix H

Keesler Survey Demographics



Encountered Dietary Supplement Adverse Events



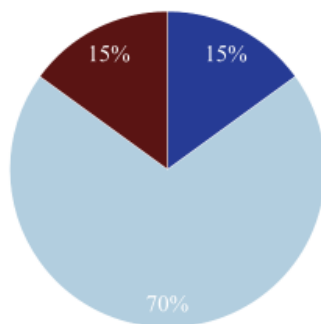
(Pascale, et al., 2016)

Appendix H

Keesler providers: Know 'Where' and 'How' to Report

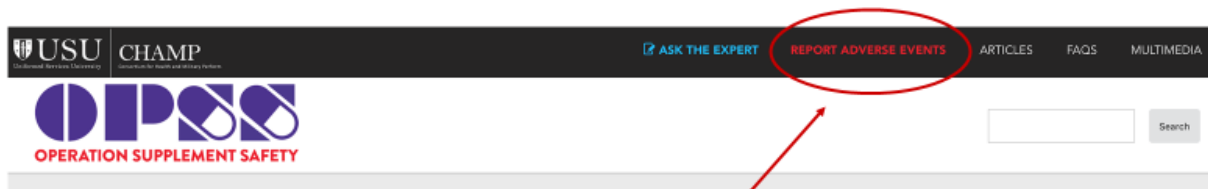
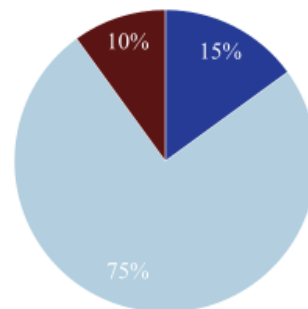
Know WHERE to Report (n=20)

■ Yes ■ No ■ Unsure



Know HOW to Report (n=20)

■ Yes ■ No ■ Unsure

www.opss.org

'Where' & 'How' to report DS AE

- Report to Natural MedWATCH using online form:

<https://naturaldatabase.therapeuticresearch.com/nd/adverseevent.aspx>



Appendix H

Natural MedWatch: Adverse Event Reporting Form

Home Search Browse Continuing Education Clinical Mgmt. Series About the Database Evidence-Based NAMS® Read Reviews See a Sample Full Product List Mobile Version Email Us Tell Jeff a Topic Idea Positions Open Our Team Newsroom You may be interested in some of our other websites:

NATURAL MEDICINES
COMPLEMENTAL & ALTERNATIVE
MEDICINE LETTER

PHARMACIST'S LETTER

PHARMACY TECHNICIAN'S LETTER

PHARMACY - STUDENT SERVICES - UNIVERSITY

IDENT-A-DRUG REFERENCE

NATURAL MedWATCH

To report an adverse event or side effect related to a natural medicine, complete the form below. Your report will improve healthcare by aiding researchers and will be forwarded to the appropriate regulatory agency...such as the Food and Drug Administration.

If you have any questions, see our [Frequently Asked Questions \(FAQ\)](#) or [learn more about Natural MedWatch](#).

1. Your name:
First: JANE
Last: DOE

2. Your profession:
Do you represent a product manufacturer?
☐ Yes ☒ No
Are you a health professional?
☒ Yes ☐ No
Occupation: **Select One**
Pharmacist
Physician
Dietitian
Nurse (RN, LVN)
Nurse Practitioner
Physician Assistant
Dentist
Pharmacy Technician
Healthcare Administrator
Other:

3. Your contact information:
Phone:
Email:
Street Address:
City:
State: AL
Zip Code:
International Address:

Your Info



NATURAL
MedWATCH



4. Patient Information if known:

To protect privacy, do NOT enter patient names or any other patient identifiers. A tracking number will be issued upon completion of this report that you can use for the patient's records, if necessary.

Did you personally experience this adverse event or side effect?
☐ Yes ☐ No

Gender:
☐ Male ☐ Female

Age: years

Race/Ethnicity:
☐ American Indian or Alaska native
☐ Asian
☐ Black or African American
☐ Hispanic or Latino
☐ Native Hawaiian or Other Pacific Islander
☐ White
☐ Other

Weight lbs* kg* *unit of weight

Height:

Does this report pertain to military personnel?
☒ Yes ☐ No

What branch of service is the patient in? (select one)
☐ Air Force
☐ Army
☐ Coast Guard
☐ Marines
☐ Navy

What military installation is the patient attached to?

If the patient is currently deployed, what is the deployed location?

Patient Info



NATURAL
MedWATCH



Appendix H

Was the product of concern prescribed by a health professional?
☐ Yes ☒ No

If known, where was the product of concern? -- Select One --

5. Product(s) suspected to have caused the adverse event:
 Add suspected products

6. Other medications taken:
 Search for medications, select from a list

7. Medical conditions:
 Search for conditions, select from a list

8. Other information from the medical history:

Upload a document:
 Choose File no file selected Upload

Step 1. Enter the first few letters to search... Results will automatically be displayed below
 jack

Reset Search to Start a New Search

Step 2. Click the product to select it
 Jack'D Up by Hi-Tech Pharmaceuticals
 Jack3d [Discontinued] by USP Labs
 Jack3d Advanced Formula (assorted flavors) [Discontinued, Reformulated] by USP Labs
 Jack3d Advanced Formula (Blue Raspberry flavor) by USP Labs
Jack3d Advanced Formula (Fruit Punch flavor) by USP Labs
 Jack3d Advanced Formula (Watermelon flavor) by BSN Inc.
 Jack3D Micro by USP Labs
 Jack3D Micro [Discontinued, Reformulated] by USP Labs
 Jack3d VII University Studied (Lemon Lime flavor) [Discontinued] by USP Labs
 Jacked Up [Discontinued; Reformulated] by A.S. Research, LLC
 Jacked Up by A.S. Research, LLC

Not finding the suspected product?
 Expand your search to match your query anywhere in the product name.
 Add your entry as written if the product is not found by the search. Be sure to include the entire product name.

Step 3. Verify suspected products and click "Continue"

Suspected Products
 Jack3d Advanced Formula (Fruit Punch flavor) by

Remove Selection

Continue->

Legend:
 Commercial Product with Manufacturer
 Active Ingredient

Close Window

NATURAL MedWATCH

USU
 Uniformed Services University

Recommended ICD-10 codes for DS AEs

- T43.615: Caffeine supplements
- T45.2X5: Succinimides and oxazolidinediones
- T50.0X5: Mineralocorticoids and their antagonists
- T50.1X5: Loop diuretics
- T50.3X5: Electrolytic, caloric, and water-balance agents
- T50.4X5: Drugs affecting uric acid metabolism
- T50.5X5: Appetite depressants
- T50.7X5: Androgens and anabolic congeners
- T50.995: Drugs, medicaments, and biological substances

(OPSS, 2014)

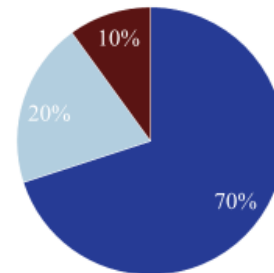
Appendix H

What is Third-Party Certification?

- Operation Supplement Safety definition
- Encourage patients to seek out third-party certification

Third Party Certification (n=20)

■ Not Familiar ■ Moderately Familiar ■ Very Familiar



(OPSS, 2014)  Uniformed Services University

Resources

- Operation Supplement Safety (OPSS)
 - <https://www.opss.org/>
 - Resource for health care providers, leaders, warfighters and consumers
- Natural Medicine Comprehensive Database
 - <http://naturaldatabase.therapeuticresearch.com/home.aspx?cs=&s=ND>
 - Evidence-based clearinghouse of information on dietary supplements
- National Institutes of Health Office of Dietary Supplements
 - <https://ods.od.nih.gov/>
 - Vast information including dietary supplement ingredient database



 Uniformed Services University

Appendix H

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Appendix I

Provider Educational Tool



Recognizing and Reporting Adverse Events Associated with Dietary Supplement Use

Adverse events

- “Adverse events” are any events resulting in an unwanted or untoward outcome or side effects. They include any side effect that causes discomfort, illness, hospitalization, or another negative outcome.
- Adverse events can be mild or severe. Examples of adverse events include anxiety, headaches, irritability, nausea/vomiting, chest pain, increased or irregular heart rate, profuse sweating, and tingling/shakiness.
- Reporting adverse events helps the FDA identify and take action against unsafe products on the market.

Natural MedWATCH



- Report adverse events through Natural MedWATCH.
- All adverse events reported through Natural MedWATCH go to FDA (i.e., MedWATCH) and Operation Supplement Safety (OPSS) for military personnel.
- Report all suspected adverse events from dietary supplement use.
 1. Type the following address in your browser:
<https://naturaldatabase.therapeuticresearch.com/nd/adverseevent.aspx>
 2. Complete the electronic form and submit when done.

Appendix I

ICD 10 Coding

- Code for adverse events associated with dietary supplements (revised wording):

T50.995: Herbals and other botanical supplements
T50.5X5: Weight Loss Supplements
T43.615: Caffeine and other dietary stimulant-containing supplements
T45.2X5: Vitamins and/or mineral supplements
T50.0X5: Health Supplements (Joint, Heart, Brain, Gut health)
T50.4X5: Protein Supplements (Protein, creatine, amino acids)
T50.7X5: Anabolic and/or Anabolic-Like substances
T50.3X5: Sexual Enhancement
T50.1X5: Other types of supplements (unclear as to intended use and/or ingredients)

OPSS Resources

- OPSS provides multiple resources regarding dietary supplement use for warfighters, their families, health care providers, and leaders.
- The website includes further education and training material and up to date information on DoD supplement policies
- <https://www.opss.org>

Appendix J

CITI Certificates for DNP Team Members

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM) COURSEWORK REQUIREMENTS REPORT*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Marcie Hart (ID: 4988910)
- **Email:** marcie.hart@usuhs.edu
- **Institution Affiliation:** Uniformed Services University of The Health Sciences (ID: 395)
- **Institution Unit:** Graduate School of Nursing
- **Phone:** 937-608-7044

- **Curriculum Group:** OUSD P&R Human Research (Current)
- **Course Learner Group:** Biomedical Investigators and Research Study Team
- **Stage:** Stage 1 - Biomedical Investigators

- **Report ID:** 16986214
- **Completion Date:** 08/23/2015
- **Expiration Date:** 08/22/2018
- **Minimum Passing:** 80
- **Reported Score*:** 100

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED
Records-Based Research (ID: 5)	08/22/15
Vulnerable Subjects - Research Involving Children (ID: 9)	08/22/15
Vulnerable Subjects - Research Involving Pregnant Women, Human Fetuses, and Neonates (ID: 10)	08/23/15
FDA-Regulated Research (ID: 12)	08/23/15
Basic Institutional Review Board (IRB) Regulations and Review Process (ID: 2)	08/23/15
Informed Consent (ID: 3)	08/23/15
History and Ethics of Human Subjects Research (ID: 498)	08/23/15
Social and Behavioral Research (SBR) for Biomedical Researchers (ID: 4)	08/23/15
Genetic Research in Human Populations (ID: 6)	08/23/15
Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680)	08/23/15
Recognizing and Reporting Unanticipated Problems Involving Risks to Subjects or Others in Biomedical Research (ID: 14777)	08/23/15
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	08/23/15
Avoiding Group Harms - U.S. Research Perspectives (ID: 14080)	08/23/15
Office of the Under Secretary of Defense (Personnel and Readiness) (ID: 912)	08/23/15
Module for Non-DoD Personnel Conducting Research Involving Human Subjects Supported by the DoD (ID: 16769)	08/23/15
Cultural Competence in Research (ID: 15166)	08/23/15

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

CITI Program

Email: citisupport@miami.edu

Phone: 305-243-7970

Web: <https://www.citiprogram.org>

Appendix J

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM) COURSEWORK TRANSCRIPT REPORT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Marcie Hart (ID: 4988910)
- **Email:** marcie.hart@usuhs.edu
- **Institution Affiliation:** Uniformed Services University of The Health Sciences (ID: 395)
- **Institution Unit:** Graduate School of Nursing
- **Phone:** 937-608-7044

- **Curriculum Group:** OUSD P&R Human Research (Current)
- **Course Learner Group:** Biomedical Investigators and Research Study Team
- **Stage:** Stage 1 - Biomedical Investigators

- **Report ID:** 16986214
- **Report Date:** 08/23/2015
- **Current Score**:** 100

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT
History and Ethics of Human Subjects Research (ID: 498)	08/23/15
Informed Consent (ID: 3)	08/23/15
Social and Behavioral Research (SBR) for Biomedical Researchers (ID: 4)	08/23/15
Records-Based Research (ID: 5)	08/22/15
Genetic Research in Human Populations (ID: 6)	08/23/15
Vulnerable Subjects - Research Involving Children (ID: 9)	08/22/15
Vulnerable Subjects - Research Involving Pregnant Women, Human Fetuses, and Neonates (ID: 10)	08/23/15
FDA-Regulated Research (ID: 12)	08/23/15
Office of the Under Secretary of Defense (Personnel and Readiness) (ID: 912)	08/23/15
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	08/23/15
Avoiding Group Harms - U.S. Research Perspectives (ID: 14080)	08/23/15
Cultural Competence in Research (ID: 15166)	08/23/15
Basic Institutional Review Board (IRB) Regulations and Review Process (ID: 2)	08/23/15
Recognizing and Reporting Unanticipated Problems Involving Risks to Subjects or Others in Biomedical Research (ID: 14777)	08/23/15
Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680)	08/23/15
Module for Non-DoD Personnel Conducting Research Involving Human Subjects Supported by the DoD (ID: 16769)	08/23/15

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

CITI Program
 Email: citisupport@miami.edu
 Phone: 305-243-7970
 Web: <https://www.citiprogram.org>

Appendix J



Completion Date 23-Aug-2015
Expiration Date 22-Aug-2018
Record ID 16988458

This is to certify that:

Brian Kennedy

Has completed the following CITI Program course:

OUSD P&R Human Research (Current)	(Curriculum Group)
Biomedical Investigators and Research Study Team	(Course Learner Group)
1 - Biomedical Investigators	(Stage)

Under requirements set by:

Uniformed Services University of The Health Sciences

CITI

Verify at www.citiprogram.org/verify/?w22ed9da2-489c-4ea4-8d94-d2b9b4ed4e13-16988458

Appendix J

		Completion Date 16-Sep-2015 Expiration Date 15-Sep-2018 Record ID 16993151
This is to certify that:		
Denise Stiltner		
Has completed the following CITI Program course:		
OUSD P&R Human Research (Current)	(Curriculum Group)	
Biomedical Investigators and Research Study Team	(Course Learner Group)	
1 - Biomedical Investigators	(Stage)	
Under requirements set by:		
Uniformed Services University of The Health Sciences		
		
Verify at www.citiprogram.org/verify/?w22331439-3986-424f-90bf-2f1d4d3459c9-16993151		

Appendix K

Keesler Public Affairs Office Clearance for Project Dissemination

-----Original Message-----

From: MURPHY, DAVID J Capt USAF AETC 81 TRW/PA
Sent: Friday, April 6, 2018 11:47 AM
To: HART, MARCIE K Capt USAF AETC 81 MDG/SGME <marcie.hart@us.af.mil>
Subject: FW: Material for review

Capt Hart,

I concur with my AETC/PA counterpart, you're good to go to release your paper.

v/r,
Capt David J. Murphy
Comm: (228) 377-7340, DSN: 597-7340
PA Office: (228) 377-2783
Work Cell: (228) 239-3105

-----Original Message-----

From: HAWKINS, DANIEL E GS-12 USAF AETC AETC/PA
Sent: Thursday, April 5, 2018 9:57 AM
To: MURPHY, DAVID J Capt USAF AETC 81 TRW/PA <david.murphy.35@us.af.mil>
Subject: RE: Material for review

Sir,

You are correct; we do have to do a review. Reviewed & saw no OPSEC issues.

r/Dan
DANIEL E. HAWKINS
Communication Integration & Social Media
HQ AETC Public Affairs
JBSA-Randolph, TX 78108
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-----Original Message-----

From: MURPHY, DAVID J Capt USAF AETC 81 TRW/PA
Sent: Wednesday, April 4, 2018 9:33 PM
To: HAWKINS, DANIEL E GS-12 USAF AETC AETC/PA <daniel.hawkins.10@us.af.mil>
Subject: FW: Material for review

Mr. Hawkins,

Appendix K

Does AETC/PA have any issues with the publication and presentation of material that relates to dietary supplement use at Keesler Air Force Base?

I don't see any OPSEC consideration but since this is a research paper I'm under the impression that it has to be reviewed by your office.

v/r,

Capt David J. Murphy

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Appendix L

Doctor of Nursing Practice Project Completion Verification Form



Appendix J: Daniel K. Inouye Graduate School of Nursing
DNP Project Completion Verification Form

DOCTOR OF NURSING PRACTICE PROJECT Completion Verification Form

The DNP Project titled: Dietary Supplement Adverse Event Reporting and Coding at Keesler Air Force Base was completed at Keesler Medical Center by the following student(s):

<i>(type student name)</i>	<i>(signature)</i>	<i>(date)</i>
<u>Capt Marcie Hart</u>		_____
<u>Maj Brian Kennedy</u>		_____
<u>Maj Denise Stiltner</u>		_____

The DNP Practice Project Title is _____. The DNP project, accomplished by the above students, is of sufficient rigor and demonstrates doctoral level scholarship to meet the requirements for USUHS GSN graduation:

- ☐ Presentation of DNP project to the leadership/stakeholders at the Phase II Site,
- ☐ Abstract/Impact Statement (*Appendix F*), and
- ☐ DNP Project written report.

Verified by:

<i>(type name)</i>	<i>(signature)</i>	<i>(date)</i>
<u>Dr. Heather Johnson</u>		_____ Senior Mentor
<u>Dr. Jonathan Scott</u>		_____ Team Mentor
<u>Dr. Jennifer Varney</u>		_____ Team Mentor & Phase II Site Director

For RNA Students only - add the following additional signature for final verification of project completion:

_____	_____	_____
RNA Project Director (<i>type name</i>)	(<i>Signature</i>)	(<i>Date</i>)

Appendix L

Search Methods

Literature searches were conducted using PubMed, Scopus, and CINAHL databases. Limiters included English language and peer-review. The search terms were as follows:

PubMed; (nutraceuticals OR vitamins OR herb OR herbs OR herbal OR supplements OR supplement [ti] OR dietary supplements [mh]) AND ("primary health care"[MeSH Terms] OR "primary care" OR "primary healthcare" OR "primary health care") AND (patient education OR "patient ed" OR Patient Education as Topic[MH]) AND English[lang].

Scopus; nutraceuticals OR vitamins OR herb OR herbs OR herbal OR supplements OR supplement AND "primary care" OR "primary healthcare" OR "primary health care" AND "patient education" OR "patient ed"; Limit to English.

CINAHL; (MH "Dietary Supplements+") OR (MH "Functional Food") OR (MH "Plants, Medicinal+") OR (MH "Medicine, Herbal+") OR nutraceuticals OR vitamins OR herb OR herbs OR herbal OR supplements OR supplement (MH "Primary Health Care") OR "primary care" OR "primary healthcare" OR "primary health care" (MH "Patient Education+") OR patient education OR "patient ed" Limiters: English Language; Peer Reviewed

Initial search results netted 61 articles from PubMed, 137 articles from Scopus, and 54 articles from CINAHL; plus 9 articles identified through other sources; for a total of 261 articles. 61 duplicates were discarded leaving 200 articles. Two team members independently reviewed the article titles using the following inclusion and exclusion criteria:

Inclusion criteria:

1. Provider communication with patients re: supplements/supplement use
2. Provider knowledge/attitudes re: supplements/supplement use
3. Prevalence of supplement use among adults
4. Adverse events/adverse event reporting associated with supplement use

Exclusion criteria:

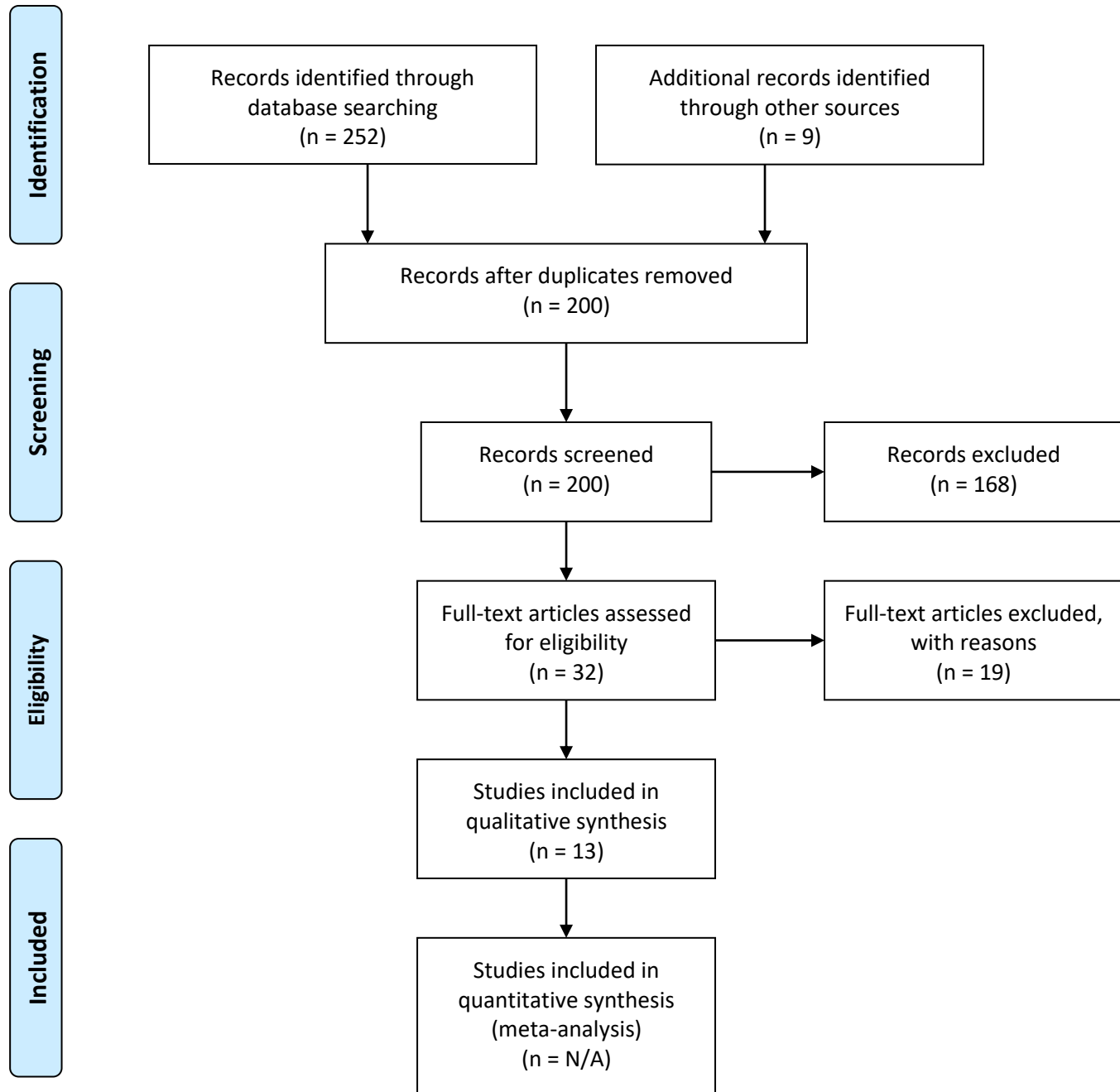
1. Patient knowledge, understanding, attitudes regarding DS
2. Efficacy of a specific compound
3. Treatment of a specific disease process

148 articles were eliminated leaving 52 articles for abstract review. Using the same inclusion and exclusion criteria, 32 articles were retained for full text review. These articles were divided among three team members. After full text-review, the articles were then reviewed by a second team member in round-robin fashion. Articles discussing DS use, regulation, and reporting in countries other than the US were discarded. Articles focused solely on DS AER by the DS industry were also discarded. Consensus among team members with regard to project relevancy left 13 articles for literature synthesis.

Appendix L



PRISMA 2009 Flow Diagram



Appendix L
Predictors of Dietary Supplement Use by U.S. Coast Guard Personnel

First Author	Austin, K.	
Article Citation	Austin, K. Price, L. L., McGraw, S. M., & Lieberman, H. R. (2015). Predictors of dietary supplement use by U.S. Coast Guard personnel. <i>PLOS ONE</i> , 10(7), 1-15. Doi: 10.1371/journal.pone.0133006	
Study Question	1) Assess DS prevalence and patterns of use in US Coast Guard (USCG) personnel. 2) Compare this assessment to reports from other Armed Forces personnel.	
Design Type	Non-Experimental; prospective cross-sectional survey of USCG personnel at multiple installations in the US	
Sample Size	What was the sample size?	1033 participants
	Is the sample patients or non-patients?	Non-patients
	If patients, what was the male/female count?	855 males/178 females
	What was the sampling method?	Convenience sample; health promotion managers approached users and non-users of DS and offered them the opportunity to participate in the study
	What was the response rate (if applicable)?	Not available
Outcome Variables & Definitions IV/DV	Frequency of survey responses.	
Measures <i>Instruments or tools used, validity and reliability, level of data?</i>	The survey used in this study (Dietary Supplement and Caffeine Intake Survey of U.S. Coast Guard Active Duty Personnel) was developed at U.S. Army Research Institute of Environmental Medicine and modified for USCG personnel.	
Analytical Approach <i>Statistical tests-appropriate based on design assumptions?</i>	Yes; data were weighted prior to analysis to obtain a sample representative of the overall USCG composition. Wald chi-square tests were used to test for significant differences in percentages among multiple characteristic levels. ANOVA was used to test mean values across multiple characteristic levels. Statistical comparisons were pre-planned and restricted to comparisons included in a previous study of DS use by other military personnel. Additionally use of descriptive statistics.	
Findings	70% of participants reported DS use at least once per week in the past six months; of those, 33% reported DS use 1-2x/week, 18% reported DS use 3-4x/week, and 19% reported DS use $\geq$ 5x/week. Type of products used included multivitamins and minerals (48%), protein and amino acids (33%), individual vitamin or mineral (22%), combination products (23%), herbal (9%), and steroid analogs (1%). Avg financial expenditure on DS in the prior three months was \$40; >25% spent \$50+/month on DS use. Respondents ages 18-24 and 25-29 years of age were more than twice as likely to use protein and amino acid DS and combination products compared to those >40 years of age. Reasons for DS use included general health promotion (55%), increasing muscle strength (24%), providing more energy (20%), enhancing performance (18%), and other (16%).	
Limitations	Convenience sample that was not random or stratified. As a self-report survey, this study may reflect recall bias of participants regarding DS use over the prior six months. No data on non-users.	

Level of Evidence	Level VI	Quality of Evidence (Research)	Low
General Comments			

Appendix L

Self-reported Side-effects Associated with Use of Dietary Supplements in an Armed Forces Population

First Author	Austin, K.	
Article Citation	Austin, K. G., Farina, E. K., & Lieberman, H. R. (2016). Self-reported side-effects associated with use of dietary supplements in an armed forces population. <i>Drug Testing and Analysis</i> , 8, 287-295. Doi: 10.1002/dta.1905	
Study Question	Determine: 1) how providers address the issue of dietary supplements with patients, 2) provider and consumer knowledge regarding DS and AER systems, 3) which DS used by patients was viewed as problematic, and 4) which AEs were commonly seen and their possible association with various DS	
Design Type	Non-Experimental; prospective cross-sectional assessment using two web-based questionnaires	
Sample Size	What was the sample size?	1207 (Army), 1787 (Air Force), 1059 (Coast Guard), and 483 (deployed); 96 excluded; total of 4400
	Is the sample patients or non-patients?	Non-patients
	If patients, what was the male/female count?	80% male/20% female
	What was the sampling method?	Convenience. Healthcare professionals worked with unit commanders to work out a time and place to distribute paper surveys in-person. Participation was voluntary.
	What was the response rate (if applicable)?	Not available
Outcome Variables & Definitions <i>IV/DV</i>	Frequency of survey responses.	
Measures <i>Instruments or tools used, validity and reliability, level of data?</i>	The Dietary Supplement Survey of US Army Active Duty Personnel has been used previously. The survey was modified to accommodate the other Services.	
Analytical Approach <i>Statistical tests-appropriate based on design assumptions?</i>	Yes; multivariable logistic regression. Additionally use of descriptive statistics.	

Findings	Females were more likely than males to use multivitamins and minerals of individual vitamins and minerals and less likely to use protein or combination products. Education level correlated with the type of DS used. Higher BMI correlated with the type of DS used. Age correlated with frequency of DS use and type of DS used. Amount of time spent in aerobic exercise correlated with type of DS used. Males were more likely to report dizziness as a side effect (SE) than females. Those with some college education were more likely to report stomach pain than those with high school education. Those with a BMI $\geq$ 30 were more likely than those with a BMI of 18-24.9 to report abnormal heart beats, stomach pain, dizziness, and tremors. Those with a BMI of 25.0-29.9 were more likely than those with a BMI of 18-24.9 to report tremors. Those aged 18-24 years were more likely to report experiencing numbness or tingling than those aged 40 and older. Higher rates of multiple DS use correlated with higher rates of self-reported side effects.		
Limitations	Convenience sample. Self-report surveys are subject to recall bias. Potential for underreporting of steroid analogs given military policy against use of these substances. Prevalence of side effects in overall military population was not determined in this study and the authors recommend caution in interpreting the findings.		
Level of Evidence	Level VI	Quality of Evidence (Research)	Good
General Comments			

Appendix L

Longitudinal Trends in Use of Dietary Supplements by U.S. Army Personnel Differ from Those of Civilians

First Author	Austin, K. G.	
Article Citation	Austin, K. G., Price, L. L., McGraw, S. M., McLellan, T. M., & Lieberman, H. R. (2016). Longitudinal trends in use of dietary supplements by U.S. Army personnel differ from those of civilians. <i>Applied Physiology, Nutrition, and Metabolism</i> , 41, 1217-1224. Doi: dx.doi.org/10.1139/apnm2016-0296	
Study Question	Examine longitudinal changes in DS use by U.S. Army personnel.	
Design Type	Non-Experimental; cross-sectional assessment using a standardized questionnaire on DS use; survey was previously administered by Lieberman <i>et al.</i> , (2010).	
Sample Size	What was the sample size?	1207
	Is the sample patients or non-patients?	Non-patients
	If patients, what was the male/female count?	1020 males/176 females
	What was the sampling method?	Convenience sample. Health care professionals assisted with administering survey. Participation was voluntary
	What was the response rate (if applicable)?	Not available
Outcome Variables & Definitions IV/DV	Frequency of survey responses.	
Measures <i>Instruments or tools used, validity and reliability, level of data?</i>	The Dietary Supplement and Caffeine Intake Survey of U.S. Army Active Duty Personnel.	
Analytical Approach <i>Statistical tests-appropriate based on design assumptions?</i>	Yes; data were weighted prior to analysis to obtain a sample representative of the overall Army composition. Wald chi-squared tests were used to assess significant differences in mean percentages among multiple characteristic levels. The PROC SURVEYFREQ procedure was used to test differences in reported rates of DS consumption across multiple characteristic levels. Standard errors were estimated using Taylor series linearization method that incorporated sampling weights. Logistic regression models were used to examine interactions between measures.	
Findings	Any DS use (at least 1x/week) in the prior six months, when compared to previous survey data, increased from 56% to 64%. Self-reported consumption of amino acids and protein DSs increased from 22% to 26%; combination DS use increased from 10% to 24%; 'other' DS use increased from 13% to 17%; steroid analog use decreased from 3% to 1%. Expenditures on DS use increased over time. Overall use of any DS was significantly greater in those respondents reporting a history of deployment and in combat arms and combat support personnel. Factors correlating with higher DS (with the exception of vitamins and minerals) use included male gender, combat arms/support jobs. Several other factors were examined to include age, marital status, BMI, amount and type of exercise, and educational level; there were nuances among these factors and categories of DS used.	
Limitations	Convenience sampling. Self-reported surveys have a recall bias.	

Level of Evidence	Level VI	Quality of Evidence (Research)	Good
General Comments			

Appendix L

Demographic, Lifestyle Factors, and Reasons for Use of Dietary Supplements by Air Force Personnel

First Author	Austin, K. G.	
Article Citation	Austin, K. G., Price, L. L., McGraw, S. M., Leahy, G., & Lieberman, H. R. (2016). Demographic, lifestyle factors, and reasons for use of dietary supplements by Air Force personnel. <i>Aerospace Medicine and Human Performance</i> , 87(7), 628-637. Doi: 10.3357/AMHP.4513.2016	
Study Question	Assess prevalence of DS use and reasons for DS use among Air Force personnel. Directly compare findings to DS use by Army personnel.	
Design Type	Non-Experimental; cross-sectional assessment using a standardized questionnaire	
Sample Size	What was the sample size?	1750
	Is the sample patients or non-patients?	Non-patients
	If patients, what was the male/female count?	1315 males/435 females
	What was the sampling method?	Convenience sampling at 8 USAF installations within the U.S. (7) and overseas (1), chosen partially based on the availability of healthcare professionals to assist with the survey. Basic trainees & those in a transitional status were excluded.
	What was the response rate (if applicable)?	Not reported
Outcome Variables & Definitions IV/DV	Frequency of survey responses.	
Measures <i>Instruments or tools used, validity and reliability, level of data?</i>	Standardized survey tool that was identical in most respects to The Dietary Supplement and Caffeine Intake Survey of the U.S. Army Active Duty Personnel used to assess Army, Coast Guard, and college student DS use but was customized to reflect USAF specific factors such as occupational specialties. The authors did not provide survey tool reliability and validity information. Nominal and ordinal data obtained: sex (male/female), age, education, rank, marital status, assignment (combat, operational, support), tobacco use, deployed, BMI, weekly aerobic exercise duration, and weekly strength training duration. The survey included 43 questions of types of DS used, frequency (never, 1 time/month, 1 time/week, >1 time/week, and daily), reason for use (general health, enhance performance, increase muscular strength, weight loss, unsure, or other), and money spent on DS over the past 6 months. 92 individual supplements were listed including 55 general supplements such as multivitamins, individual vitamins and minerals, antioxidants, and 37 brand name products. The brand name product list was selected for inclusion based on then-current patterns of dietary supplement purchases from AAFES and GNC stores on or near Air Force installations. Participants were also asked about sports drinks, bars or gels, and meal replacement beverages. These were analyzed separately. DS and subcategories were defined by the authors consistent with definitions in The Dietary Supplement and Caffeine Intake Survey of the U.S. Army Active Duty Personnel.	
Analytical Approach <i>Statistical tests-appropriate based on design assumptions?</i>	Completed surveys were scanned using ScanTools Plus and imported into SPSS. Data were weighted before analysis to obtain a sample representative of the overall USAF for the same timeframe. Weights were based on demographics obtained from the Defense Manpower Data Center. Models were adjusted for age, sex, and rank. Statistical methods included Wald x2, ANOVA, and logistic regression. Standard errors were estimated using a Taylor series linearization method. All analytical methods were appropriate.	

Findings	DS use is 68% among Air Force personnel; 35% used 1-2 DS at least once per week; 13% used 3-4 DSs at least once per week; 20% used five or more DSs at least once per week. Products used included multivitamins and minerals (45%), protein supplements (33%), individual vitamins and minerals (22%), combination products (22%), and herbals (7%). Exercise duration and strength training as well as a history of deployment correlated with increased DS use. Prevalence of DS use, the number of DS used per week, financial expenditures on DS, multivitamin and mineral and protein and amino acid use was greater among those who performed more than 60 minutes of aerobic activity per week, those who performed strength training and those with a history of deployments. Greater odds of DS use were found among women, personnel over 24, those who participated in more aerobic and strength training, respondents with higher levels of education, personnel who were overweight (BMI 24-29.9), rank E5-E9 and officers. Multivitamin and mineral use was significantly higher among females, those over age 24, increased level of education or rank, and history of deployments. Protein and amino acid use were significantly greater among males, and respondents 25-29. The use of combination products was more prevalent among men, respondents with some college education, and BMI 25 or greater. The use of herbals was used more frequently by respondents with some college education or a college degree. Increased BMI was associated with greater expenditure on DS. Reasons for DS use included promoting overall health (52%), increasing muscle strength (23%-protein and amino acids), providing more energy (21%), enhancing performance (21%- combination products), or other (16%). Discussion comparisons to civilian population data: Regular use of DS supplements in the USAF is much higher than a civilian in the general population. USAF personnel was more likely to use performance-enhancing DS compared to the civilian population. USAF personnel uses more protein and amino acid and combination products than the general population. USAF personnel uses more multivitamins and minerals than civilians or soldiers. Female USAF personnel is more likely to use DS, like the civilian population but unlike soldiers. USAF DS use was associated with an increase in physically active individuals consistent with civilian use. The most common reason cited for the use of DS by USAF personnel was to improve health which is consistent with civilians. However, a significantly greater proportion reported the use of DS to increase energy, improve muscle strength, enhance performance increase endurance, and facilitate weight loss which are similar reasons for use in soldiers.		
Limitations	Sampling and response/recall bias. Authors provided no data on non-responders. The authors use the word soldier to describe participants instead of the proper Airman term which could be confusing.		
Level of Evidence	Level VI	Quality of Evidence (Research)	Good
General Comments	Unique, first to mention random drug testing as a concern for USAF members using DS.		

Appendix L**Dietary Supplements: Physician Knowledge and Adverse Event Reporting**

First Author	Cellini, M.	
Article Citation	Cellini, M., Attipoe, S., Seales, P., Gray, R., Ward, A., Stephens, M., & Deuster, P. A. (2013). Dietary supplements: Physician knowledge and adverse event reporting. <i>Medicine & Science in Sports & Exercise</i> , 45(1), 23-28.	
Study Question	Determine: 1) how providers address the issue of dietary supplements with patients, 2) provider and consumer knowledge regarding DS and AER systems, 3) which DS used by patients was viewed as problematic, and 4) which AEs were commonly seen and their possible association with various DS	
Design Type	Non-Experimental; prospective cross-sectional assessment using two web-based questionnaires	
Sample Size	What was the sample size?	1007 (NMCD) + 401 (USU) =1408
	Is the sample patients or non-patients?	Non-patients
	If patients, what was the male/female count?	N/A
	What was the sampling method?	Online survey questions for healthcare personnel visiting Natural Medicines website and targeted email to university alumni with questionnaire
	What was the response rate (if applicable)?	NMCD – N/A; USU – 21% response rate
Outcome Variables & Definitions IV/DV	Frequency of survey responses.	
Measures <i>Instruments or tools used, validity and reliability, level of data?</i>	Primary) Natural Medicines Comprehensive Database Questionnaire and USU Alumni Questionnaire. Both questionnaires were developed for this study.	
Analytical Approach <i>Statistical tests-appropriate based on design assumptions?</i>	Yes; use of SPSS to analyze frequency distributions of questionnaire responses. Additionally use of descriptive statistics.	
Findings	Of 1007 health care providers: 79% reported they routinely queried their patients regarding using DS; 75% stated their patients routinely asked about or discussed DS related issues with them; 20% indicated they had a reliable source of information on DS or herbal products; 98% desired a trustworthy, frequently updated resource with information about DS; 35% reported encountering a patient who had experienced a potential AE and only 20% reported the suspected AE; 59% did not know how or where to report the AE; 86% desired access to a simple, electronic, online tool to facilitate reporting AE. Of the 251 USU alumni physicians: 18% reported they had a dependable source for DS information; 91% state they ask their patients about DS use; 82% reported discussing DS with their patients; 58% reported they had encountered a patient with a possible AE from DS and only 16% reported the AE; 74% reported they did not know how or where to report such an event; 90% expressed interest in a simple, electronic, online tool for reporting AE.	

Limitations	Sampling and response bias.		
Level of Evidence	Level VI	Quality of Evidence (Research)	Good
General Comments			

Appendix L

The State of Dietary Supplement Adverse Event Reporting in the United States

First Author	Gardiner, P.		
Article Citation	Gardiner, P., Sarma, D. D., Dog, T. L.,Barrett, M. L., Chavez, M. L., Ko, R., ...Giancaspro, G. I. (2008). The state of dietary supplement adverse event reporting in the United States. <i>Pharmacoepidemiology and Drug Safety</i> , (17), 962-970.		
Study Question	To identify shortcomings and areas for improvement based on current DS AER in the US.		
Design Type	Opinion of an expert committee (Dietary Supplements Information Expert Committee (DSI-EC)) based on report reviews of numerous national and federal agencies (FDA MedWatch, Toxic Exposure Surveillance System (TESS), American Association of Poison Control Centers (AAPCC)) and a PubMed search.		
Sample Size	What was the sample size?	N/A	
	Is the sample patients or non-patients?	N/A	
	If patients, what was the male/female count?	N/A	
	What was the sampling method?	N/A	
	What was the response rate (if applicable)?	N/A	
Outcome Variables & Definitions <i>IV/DV</i>	AERs submitted to various agencies.		
Measures <i>Instruments or tools used, validity and reliability, level of data?</i>	Information not provided by authors.		
Analytical Approach <i>Statistical tests-appropriate based on design assumptions?</i>	No clear information on the systematic review or how it was conducted.		
Findings	Overall AERs are low but FDA's AER system is underutilized; many AERs are reported through Poison control centers; AERs are often incomplete and therefore it is difficult to take action and use them; limited interface between these two and other agencies is problematic; The committee makes several recommendations based on these results.		
Limitations			
Level of Evidence	Level VII	Quality of Evidence <i>(Research)</i>	Poor – not enough information on how the committee obtained their results for their recommendations
General Comments			

Appendix L

Emergency Department Visits for Adverse Events Related to Dietary Supplements

First Author	Geller, A. I.	
Article Citation	Geller, A. I., Shehab, N., Weidle, N. J., Lovegrove, M. C., Wolpert, B. J., Timbo, B. B., Mozersky, R. P., & Budnitz, D. S. (2015). Emergency department visits for adverse events related to dietary supplements. <i>The New England Journal of Medicine</i> , 373(16), 1531-1540. Doi: 10.1056/NEJMsa1504267	
Study Question	Estimate the number of emergency room (ER) visits in the US that are associated with DS adverse events.	
Design Type	Non-experimental; descriptive	
Sample Size	What was the sample size?	Ten years of data from 63 hospitals comprising a nationally representative probability sample drawn from all hospitals with at least six beds and 24-hour emergency departments in the US and its territories.
	Is the sample patients or non-patients?	N/A
	If patients, what was the male/female count?	N/A
	What was the sampling method?	Abstractors reviewed clinical records at each participating ER
	What was the response rate (if applicable)?	N/A
Outcome Variables & Definitions <i>IV/DV</i>	Cases meeting study definition, i.e., clinician explicitly attributing the visit to the use of DSs. Adverse events were categorized as either 1) adverse reactions, 2) allergic reactions, 3) excess doses, 4) unsupervised ingestion by children, or 5) other. Deaths were excluded. Events involving intentional self-harm, drug abuse, therapeutic failures, non-adherence, or withdrawal were also excluded. 3667 cases were identified.	
Measures <i>Instruments or tools used, validity and reliability, level of data?</i>	Narrative data from clinical records were coded with the use of <i>Medical Dictionary for Regulatory Agencies</i> (version 9.1). Census Bureau data was used to calculate population rates.	
Analytical Approach <i>Statistical tests-appropriate based on design assumptions?</i>	Adverse event cases were weighted by the Consumer Product Safety Commission. Authors calculated national estimates as the sum of the number of cases multiplied by their respective weights using the SURVEYMEANS procedure in SAS software. Authors divided cumulative estimates by 10 to obtain annual estimates. SURVEYFREQ procedure with the Rao-Scott modified chi-square test was used to assess differences in weighted portions. SURVEYLOGISTIC and SURVEYREG procedures were used to assess linear trends in biennial estimates of ER visits. Analyses of implicated products and symptoms were limited to cases in which a single DS product was used; unsupervised ingestion by children were analyzed separately.	
Findings	Based on 3667 cases over 10 years (2004-2013) the authors calculated an annual average of 23,005 ER visits per year associated with DS adverse events (95% CI). They further estimated that this would result in an average of 2154 annual hospitalizations. More than half of the visits involved female patients. The mean age was 32 years. 28% of ER visits occurred in those aged 20-34 years. People older than 65 were more likely to be hospitalized than younger patients, 16% and 8.4% respectively. After excluding visits for unsupervised ingestion by children, 65.9% of visits were attributed to a single herbal or nutritional product; in 25.5% of the visits weight loss products were implicated; in 10% of visits energy products were implicated. Cardiac symptoms were most commonly associated with weight loss products (42.9% of patients); also with energy products (46% of patients), body-building products (49.8%), and sexual enhancement products (37.3%). The most	

	common adverse events from most micronutrients were mild-to-moderate allergic reaction (40.6%) and swallowing problems (41%) (combination of choking and pill-induced dysphagia or globus). Swallowing problems were most commonly associated with calcium products, whereas nausea, vomiting and abdominal pain were more frequently associated with iron or potassium products.		
Limitations	Authors note their estimations are probably low given underreporting of DS use by patients and the potential for physicians not to associate symptoms with DS use. There may be limited physician knowledge on the interactions between medications and DS. Authors further acknowledge the possibility that ER physicians may incorrectly link certain symptoms to DS, which could lead to overestimation.		
Level of Evidence	Level VI	Quality of Evidence (<i>Research</i>)	Good
General Comments	Authors included products that do not fall under the regulatory definition of dietary supplements; these included topically administered herbal and homeopathic products.		

Appendix L**A Systematic Review and Meta-analysis on the Prevalence of Dietary Supplements Use by Military Personnel**

First Author	Knapik, J.	
Article Citation	Knapik, J., Steelman, R., Hoedebecke, S., Farina, E., Austin, K., & Lieberman, H. (2014). A systematic review and meta-analysis on the prevalence of dietary supplement use by military personnel. <i>BMC Complementary and Alternative Medicine</i> , 14(143), 1-19.	
Study Question	A systematic literature review is describing the prevalence of DS use in military personnel.	
Design Type	Systematic review and meta-analysis	
Sample Size	What was the sample size?	33 articles for qualitative synthesis & 14 articles for quantitative synthesis (meta-analysis)
	Is the sample patients or non-patients?	Non-patients
	If patients, what was the male/female count?	Not provided
	What was the sampling method?	Literature search using review criteria
	What was the response rate (if applicable)?	Variable
Outcome Variables & Definitions <i>IV/DV</i>	Respondents are the dependent variables, and survey questions are independent variables.	
Measures <i>Instruments or tools used, validity and reliability, level of data?</i>	The methodological quality of the investigations was assessed using the technique of Loney et al. Studies were graded on an 8-point scale by three authors independently. The studies used various self-reported questionnaires and surveys; two studies used 7-day food records complemented with interviews by dietitians. The information gathered was nominal and ordinal.	
Analytical Approach <i>Statistical tests-appropriate based on design assumptions?</i>	The Comprehensive Meta-Analysis Statistical Package version 2 was used to perform a meta-analysis on specific groups and specific DS. The authors recalculated some response rates to include incomplete or improperly completed questionnaires. The statistical analysis was appropriate.	
Findings	Reporting time frame differed through many of the studies regarding frequency of use. Ratings from the methodological quality reviews ranged from 25-91% with an average rating of 52%, and only eight studies had a rating of 70% or more. Therefore, the overall quality of the studies was low. Among men in the four military services use of supplements of any kind ranged from 53%-61%. Among women, use of supplements of any kind ranged from 66%-76%. Supplement use among elite Army and Navy groups ranged from 56%-90%. Women use vitamin and mineral supplements more often than men regardless of service. Multivitamins are the most commonly used DS among the general population of military personnel. The most common rationale for taking multivitamins was to promote general health. Discussion comparisons to civilian population data: Women were more likely to use DSs than men, consistent with NHANES and NHIS general population survey data. The use of multivitamins is higher among military personnel than the general population.	
Limitations	Author listed limitations: studies differed on the reporting timeframe, questionnaire construction, and supplement definitions which made it difficult to compare results across all studies directly. The authors examined specific DS and did not include DS in broad categories, and that may have underestimated DSs in some categories. Some service members may have been involved in one or more surveys, although this	

	number is likely to be small. Analysis of temporal trends depended on the publication year which was likely not the year that the data was collected. Self-reporting could be problematic with recall and reluctance to report DS use.		
Level of Evidence	Level V	Quality of Evidence (Research)	Good
General Comments			

Appendix L

Prevalence, Adverse Events, and Factors Associated with Dietary Supplement and Nutritional Supplement Use by US Navy and Marine Corps Personnel

First Author	Knapik, J.	
Article Citation	Knapik, J. J., Trone, D. W., Austin, K. G., Steelman, R. A., Farina, E. K., & Lieberman, H. R. (2016). Prevalence, adverse events, and factors associated with dietary supplement and nutritional supplement use by US Navy and Marine Corps personnel. <i>Journal of the Academy of Nutrition and Dietetics</i> , 116(9), 1423-1442.	
Study Question	To complete the survey of military services by assessing the types and number of supplements used, factors associated with supplement use, and the incidences of adverse events (AE) associated with supplement use by active-duty Navy and Marine Corp personnel.	
Design Type	Non-experimental; cross-sectional survey	
Sample Size	What was the sample size?	1708 participants; 1683 used in analysis (983 Marines Corp, 700 Navy personnel)
	Is the sample patients or non-patients?	Patients
	If patients, what was the male/female count?	Male 1,198/Female 485
	What was the sampling method?	Random selection of 10,000 active-duty personnel from the Defense Manpower Data Center (DMDC). A postal letter which included a pre-incentive 10\$ gift card was sent to the random sample population. Follow-up emails and postcards were sent over a period of three months if no response was received.
	What was the response rate (if applicable)?	17.7% total response rate; 17.2% Marine Corps, 18.4% Navy
Outcome Variables & Definitions <i>IV/DV</i>	Questionnaire responses.	
Measures <i>Instruments or tools used, validity and reliability, level of data?</i>	Online questionnaire/survey developed by the authors like the Dietary Supplement and Caffeine Intake Survey of the U.S. Army Active Duty Personnel. Survey tool reliability and validity information was not provided, but it was an instrument used in previous surveys in the U.S. Army population. Nominal and ordinal data obtained: sex (male/female), age, education, rank, marital status, occupation assignment (combat arms, combat support, combat service), special operations status, BMI, weekly aerobic exercise duration, and weekly strength training duration. The survey included questions on dietary and nutritional supplement use: frequency (never, 1 time/month, 1 time/week, >1 time/week, 2-6 times per week, and daily), adverse events associated with any of the supplements listed, and money spend on DS over the past 6 months. Questions about specific DS included 70 general supplements such as multivitamins, individual vitamins and minerals, antioxidants, and 111 brand name products. The brand name product list was selected for inclusion based on a survey of dietary supplement and nutritional supplement inventories in the Navy and Marine Corps Exchange System and GNC stores on or near Navy or Marine Corp installations. DS and subcategories were defined by the authors.	
Analytical Approach <i>Statistical tests-appropriate based on design assumptions?</i>	The survey was conducted online via a secure website. All statistical analysis was conducted using SPSS (x2, one-way analysis of variance, multivariate logistic regression). All analytical methods were appropriate.	
Findings	73% of survey participants reported taking one or more DS one or more times per week. Women were more likely to take multivitamins, individual vitamin and minerals and other. Men were more likely to take protein or amino acid supplements, prohormones, and joint health	

	products. Younger service members were less likely to take DS, but if they did were more likely to take several (five or more DS one or more times per week). Personnel with higher BMI (25 or higher) were more likely to consume DS. Individuals performing more strength training and to a lesser extent, aerobic activity was more likely to take DS. 53 % of respondents reporting using one or more nutritional supplement in the past six months. Men were more likely to consume sports drinks and women were more likely to consume meal replacement beverages. Factors independently associated with any dietary supplement use, use of five or more, and multivitamins include female sex, higher educational level, higher BMI and longer weekly duration of resistant training. Protein/ AA supplement was associated with male sex, higher educational level, BMI 25.0-29.9, and longer weekly resistance training. 22% of respondents reported an adverse event with the use of DS. Responders vs. non-responders – responders, were older, more likely to be women, and had some college or higher education. Discussion comparisons to civilian population data: Authors used the National Health and Nutrition Surveys (NHANES) to compare their results with the civilian population. General population DS use is significantly lower (48% in 2008) than those described in this questionnaire by Navy/Marine Corp personnel. The service members in the study had much higher uses of DS, especially multivitamins, and proteins/amino acids, but similar use of herbals when compared to the general population.		
Limitations	Authors reported limitations: all data were self-reported and suffer from recall bias, social desirability, errors in self-observation, and inadequate recall. There was response bias present based on the analysis of responders versus non-responders.		
Level of Evidence	Level VI	Quality of Evidence <i>(Research)</i>	Good
General Comments			

Appendix L
Use of DS Among Active-Duty U.S. Army Soldiers

First Author	Lieberman, H.	
Article Citation	Lieberman, H., Stavinoha, T. McGraw, S., White, A., Hadden, L., & Marriott, B. (2010). Use of DS among active-duty U.S. Army soldiers. American Journal of Clinical Nutrition, 92, 985-995.	
Study Question	Assess the use of DS (DS), sports drinks, bars, gels, and meal replacement beverages, the reasons for their use, and DS expenditures among active duty army personnel and to compare their use with the general population.	
Design Type	Non-experimental; cross-sectional descriptive study	
Sample Size	What was the sample size?	990
	Is the sample patients or non-patients?	Non-patients
	If patients, what was the male/female count?	859 males/131 females
	What was the sampling method?	Convenience sampling at 11 U.S. Army installations within the U.S. (9) and overseas (2), chosen based on the distribution of the soldier population and their availability. Basic trainees & those in advanced individual training (AIT) were excluded as were soldiers in transitional status.
	What was the response rate (if applicable)?	Estimated response rate of 80%
Outcome Variables & Definitions IV/DV	Respondents are the dependent variables, and survey questions are independent variables.	
Measures <i>Instruments or tools used, validity and reliability, level of data?</i>	Authors created the survey tool: The Dietary Supplement and Caffeine Intake Survey of the U.S. Army Active Duty Personnel. Survey tool reliability and validity information was not provided. A pilot survey was provided to 30 Army soldiers to assess their comprehension of the study questions and to determine the time required to complete the survey. A dietitian/healthcare professional provided a standard presentation in a classroom setting followed by administering the questionnaire. Nominal and ordinal data obtained: sex (male/female), age, education, a member of Special Forces, rank, marital status, assignment (combat arms, combat support, combat service), tobacco use, deployed, the number of deployments, BMI, weekly aerobic exercise, and weekly strength training. The survey included 43 questions of types of DS used, frequency (never, 1 time/month, 1 time/week, >1 time/week, and daily), reason for use (general health, enhance performance, increase muscular strength, weight loss, unsure, or other), and money spent on DS over the past 6 months. 92 individual supplements were listed including 55 general supplements such as multivitamins, individual vitamins and minerals, antioxidants, and 37 brand name products. The brand name product list was selected for inclusion based on then-current patterns of dietary supplement purchases from AAFES and GNC stores on or near Army installations. Participants were also asked about sports drinks, bars or gels, and meal replacement beverages. These were analyzed separately. DS and subcategories were defined by the authors to reflect the Dietary Supplement Health and Education Act 1994 definitions.	
Analytical Approach <i>Statistical tests-appropriate based on design assumptions?</i>	Completed surveys were scanned using ScanTools Plus and imported into SPSS and SAS for data analysis (t test, mean, Wald chi-square tests, and logistic regression). Data were weighted before analysis to obtain a sample representative the overall Army. Weights were based on demographics obtained from the Defense Manpower Data Center. SE was estimated using Taylor series linearization method. All analytical methods were appropriate.	
Findings	>50% of soldiers reporting using a DS at least once/week for the six months before the survey. Mean monthly expenditure on DS was \$38. Prevalence of use was higher who were older, had attained more advanced education, were officers and were members of the Special Forces	

	(25% higher prevalence of use). Users of DS had a higher BMI, were less likely to use tobacco, and more likely to participate in strength training. Soldiers who reported taking a greater variety of DS each week engaged in more aerobic exercise and strength training. Multivitamins and multimineral were consumed most frequently (37.5%). Various specific populations had higher/lower rates of DS use based on age, and officer/enlisted status. Discussion comparisons to civilian population data: Soldiers used had a similar prevalence of use when compared to civilian adults, 53.2%, and 52.0% respectively. Both civilians and soldiers used multivitamins as the most widely used DS and users tended to be older and more educated. DS use among women is higher in the civilian population than female soldier in this survey. Both soldiers and civilians have increased the prevalence of DS use with increased aerobic and strength training. Soldiers use more protein and amino acid supplements as well as more combination products than civilians. The most common reason for taking DS is consistent between civilians and soldiers (to improve overall health), but significantly more soldiers take supplements to increase energy, increase muscle strength, and enhance performance.		
Limitations	No limitations listed by authors. Potential for selection bias due to convenience sample; possible recall bias; no information on non-responders.		
Level of Evidence	Level VI	Quality of Evidence (Research)	Good
General Comment	This study was the initial study that was included in the longitudinal trends analysis by Austin et al. (2016).		

Appendix L

Dietary Supplements: Knowledge and Adverse Event Reporting Among American Medical Society for Sports Medicine Physicians

First Author	Pascale, B.		
Article Citation	Pascale, B., Steele, C., Attipoe, S., O’Connor, F. G., & Deuster, P. (2016). Dietary supplements: Knowledge and adverse event reporting among American medical society for sports medicine physicians. <i>Clinical Journal of Sports Medicine</i> , 26(2), 139-144.		
Study Question	Assess physician knowledge among members of the American Medical Society for Sports Medicine (AMSSM) regarding DS use among patients. Assess knowledge of same population on reporting suspected DS adverse events.		
Design Type	Non-experimental; retrospective cross-sectional web-based survey		
Sample Size	What was the sample size?	311	
	Is the sample patients or non-patients?	Non-patients	
	If patients, what was the male/female count?	Not reported	
	What was the sampling method?	Convenience sampling; web-based survey sent via email to members of a professional medical society.	
	What was the response rate (if applicable)?	15%	
Outcome Variables & Definitions <i>IV/DV</i>	Raw number and percentage of responses to survey questions.		
Measures <i>Instruments or tools used, validity and reliability, level of data?</i>	A 16-item questionnaire adapted from a previous one created by scientists from the Consortium for Health and Military Performance (CHAMP).		
Analytical Approach <i>Statistical tests-appropriate based on design assumptions?</i>	Frequency distributions were used for group characterization and computed using IBM SPSS 20.0.		
Findings	71% of respondents reported encountering DS adverse events, but only 10% reported the adverse event. Reasons cited for not reporting included not knowing where (68%) or how (61%) to report and not having enough time (9%). Of those that did report, reports varied and included the FDA (35%), Natural MedWatch (13%), Poison Control (4%), another specialist (22%), and a hospital database (17%). Stimulant-based supplements were most concerning and most often associated with adverse events. 55% of respondents were unfamiliar with third-party verification programs.		
Limitations	Authors note the following limitations: 1) a small sample size (n=311), 2) no inquiry about physician use of DS, which could have impacted respondents’ answers, 3) inherent recall bias in a retrospective self-report, 4) not all surveys were completed in entirety, and 5) the questionnaire required respondents to skip some questions based on answers and this may have been confusing.		
Level of Evidence	Level VI	Quality of Evidence <i>(Research)</i>	Good
General Comment			

Appendix L

Dietary Supplements in a National Survey: Prevalence of Use and Reports of Adverse Events

First Author	Timbo, B. B.		
Article Citation	Timbo, B. B., Ross, M. P., McCarthy, P. V., & Lin, C-H. L. (2006). Dietary supplements in a national survey: Prevalence of use and reports of adverse events. <i>Journal of the American Dietetic Association</i> , 106(12), 1966-1974.		
Study Question	Examine national data on the use of dietary supplements and self-reported health problems believed to be related to dietary supplements		
Design Type	Non-experimental; analysis of national telephone survey data		
Sample Size	What was the sample size?	2743 participants	
	Is the sample patients or non-patients?	Patients	
	If patients, what was the male/female count?	Male1047/Female 1,694	
	What was the sampling method?	Patients were recruited via land-based telephone to participate in a telephone survey	
	What was the response rate (if applicable)?	30% response rate	
Outcome Variables & Definitions IV/DV	DV - Perceived AEs as described by respondents; actions taken in response to perceived AE.		
Measures <i>Instruments or tools used, validity and reliability, level of data?</i>	(Primary) Questionnaire with core set of questions for all respondents; additional questions for those who positively indicated DS use; open-ended questions were also used.		
Analytical Approach <i>Statistical tests-appropriate based on design assumptions?</i>	Yes; Chi-squared test used to ‘examine relationships among demographic variables, supplement users, supplement users with reported adverse events, and supplement users without reported adverse events.		
Findings	73% of sample ‘used a dietary supplement in the previous 12 months and 4% of them experienced an adverse event that the believed might be related to dietary supplement use’ (p. 1971). Users of dietary supplements tended to be ‘white women and have higher income and education’ (p. 1972). Those who reported AEs had a higher use of ‘all three categories of supplements’ (p. 1972). Of those respondents reporting AEs, ‘90% stopped taking the product, 48% saw a doctor, 25% reported the incident to a health authority, 12% went to the emergency room, and 9% complained to the manufacturer or place of purchase’ (p. 1971).		
Limitations	Sample bias; English speaking with land-based telephone. Self-report nature of survey.		
Level of Evidence	Level VI	Quality of Evidence (Research)	Good
General Comments			

Appendix L

Adverse Event Monitoring and Multivitamin-Multimineral Dietary Supplements

First Author	Woo, J. J. Y.		
Article Citation	Woo, J. J. Y. (2007). Adverse event monitoring and multivitamin-multimineral dietary supplements. <i>The American Journal of Clinical Nutrition</i> , 85(supplement), 323S-324S.		
Study Question	Examine factors that may contribute to low rates of DS AER.		
Design Type	Non-experimental; review.		
Sample Size	What was the sample size?	N/A	
	Is the sample patients or non-patients?	N/A	
	If patients, what was the male/female count?	N/A	
	What was the sampling method?	N/A.	
	What was the response rate (if applicable)?	N/A	
Outcome Variables & Definitions <i>IV/DV</i>	N/A		
Measures <i>Instruments or tools used, validity and reliability, level of data?</i>	N/A		
Analytical Approach <i>Statistical tests-appropriate based on design assumptions?</i>	No.		
Findings	Based on a review of 2004 FDA report and a 2001 report from the Office of the Inspector General, the author gleans factors which may contribute to AE underreporting; ‘...many consumers presume supplements to be safe, use these products without the supervision of a health care professional, and may be unaware that the FDA regulates them’ (p. 323S). Barriers to effective analysis of adverse event reports include voluntary status of reporting, limited medical information, limited product information,...numerous products with multiple ingredients’ (p. 324S).		
Limitations			
Level of Evidence	Level VII	Quality of Evidence <i>(Research)</i>	Poor
General Comments			

Appendix L

Level of Evidence Table

	Level of Evidence Rating						
Article	I	II	III	IV	V	VI	VII
(Austin, <i>et al.</i> , 2015)						X	
(Austin, <i>et al.</i> , 2016)						X	
(Austin, <i>et al.</i> , 2016)						X	
(Austin, <i>et al.</i> , 2016)						X	
(Cellini, <i>et al.</i> , 2013)						X	
(Gardiner, <i>et al.</i> , 2008)							X
(Geller, <i>et al.</i> , 2015)						X	
(Knapik, <i>et al.</i> , 2014)					X		
(Knapik, <i>et al.</i> , 2016)						X	
(Lieberman, <i>et al.</i> , 2010)						X	
(Pascale, <i>et al.</i> , 2016)						X	
(Timbo, <i>et al.</i> , 2006)						X	
(Woo, 2007)							X