

Top Nine Herbal Hazards in Anesthesia

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## Top Nine Herbal Hazards in Anesthesia

### **Abstract**

Herbs are products made from plants used to treat disease or improve quality of life. Herbal supplements have been used for centuries, but their use is increasing. Herbal products have intrinsic pharmacological activity and side effects that when combined with medications can have severe adverse effects. It is estimated that as much as 20% of the population in the United States consumes herbal supplements, and 70% of those taking herbal supplements fail to tell their physicians (Ruiz & Maldonado, 2014). With the increasing use of herbal supplements and patients' failure to mention them to providers, there is a definite need to ask patients pre-operatively for their use of supplements to prevent potential adverse events. Due to the lack of research, the American Society of Anesthesiologists has determined that there is insufficient data to provide exact dosage recommendations for individual herbs; therefore, we have reviewed the literature to examine the safety, pharmacodynamics, and pharmacokinetics of the top nine herbs most frequently used among patients.

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## Top Nine Herbal Hazards in Anesthesia

### **Problem**

The current state of the science relating to clinical anesthesia practice and herbal interactions is in its infancy. Articles supporting herbal benefits in the body are substantial, however the amount of data of herbal interactions with anesthetics is sparse. More research is needed as well as more education, for both patients and anesthesia providers on herbal interaction with anesthetic medications. Current literature suggests that herbals may be helpful in treating a plethora of ailments, possibly more effectively and less costly than many pharmaceuticals, and patients may be seeking out these remedies without informing their physicians (Frost, 2006). While antidotal evidence is culturally strong, the Food and Drug Administration approval requires statistical data that is unavailable.

The frequency of herbal use is increasing but the education surrounding herbal and interactions with anesthesia is lacking. Often patients do not discuss herbal use with their anesthesia provider on the day of surgery. An assessment of herbal use in the pre-operative interview would easily address this problem and provide a simple starting point in bridging the gap of knowledge, for both patient and provider.

A working knowledge of herbals and their interaction with anesthetics and drugs used in surgery would be expected to immensely increase patient safety. Herbal interactions with anesthetics are not well known among providers (Ang-Lee, Moss, & Yuan, 2010). Education regarding herbals in anesthesia is lacking, and a learning module would be useful in educating anesthesia providers.

The focus of this project is to develop an education module, in the form of an online Power Point presentation; a tool that would educate anesthesia providers about the most frequently used herbal preparations. There will not be a patient education factor in this project. While there are many types of herbal remedies available, the emphasis of this project will be on what anesthesia experts recognize as the top nine herbals associated with the most dangerous interactions. They include: Echinacea, Ephedra, Garlic, Ginkgo, Ginseng, Kava, Saw palmetto, St. John's Wort, and Valerian (Ang-Lee et al., 2010).

The implications collected from the current body of literature on herbal interactions with anesthesia will be used in the project design, however this topic is vast and the intent is not to provide a comprehensive but rather succinct sample of the most current literature.

### **Review of Literature**

Herbal medicines are becoming more popular today than ever before. Each year it is estimated that over half of Americans take some type of supplements, regardless if they have been proven or not to work (Ruiz & Maldonado, 2014). Some investigators found that one out of every six patients takes an herbal supplement along with their prescribed medications, which can have devastating consequences. As stated in the abstract, 70% of patients do not tell their physicians about supplements they are taking, making it difficult to anticipate or prevent life threatening drug interactions (Ruiz & Maldonado, 2014). This is also the finding in a study conducted by Rowe and Baker (2009) where it was found that 40-70% of patients did not report herbal use to their doctors. There is clearly a need for anesthesia providers to become familiar with herbals and their interactions to protect their patients from potential deadly effects.

The American Society of Anesthesiologists has implemented certain recommendations to ask patients about herbal use in preoperative interviews in order to detect any possible interactions. Recommendations suggest asking the patient to physically bring their medications they taking, and also to ask patients to stop taking these supplements two weeks prior surgery. Herbal supplements may be dispensed in pill form while others may be ingested in certain foods. Regardless of their exact intake the anesthesia provider should be aware of their mechanism of action and anesthetic implications.

Echinacea has been promoted to prevent and treat bacterial, viral, and fungal infections (Ruiz & Maldonado, 2014). It is believed to improve the immune system by modulating cytokine signaling. Echinacea has immunostimulatory effects and may offset the immunosuppressant properties of corticosteroids and cyclosporine; therefore, it is contraindicated in patients with systemic and autoimmune disorders. Since this herb is also known to cause inhibition of hepatic microsomal enzymes, caution should be used when administering phenytoin, rifampin, and barbiturates as toxicity can quickly develop.

Ephedra is used to treat the common cold, bronchitis, fever, asthma, and low blood pressure. Because it increases metabolic rate, many over the counter weight reduction preparations contain Ephedra (Frost, 2006). Ephedra is a sympathomimetic, causing direct stimulation of alpha and beta-adrenergic receptors and also indirectly increases the release of norepinephrine from presynaptic neurons (Wong & Townley, 2011). Long-term use of Ephedra can deplete endogenous catecholamines leading to intra-operative cardiovascular instability and tachyphylaxis to other sympathomimetic drugs. For treatment of hypotension, direct-acting sympathomimetics must be used (Wong & Townley, 2011). Ephedra has been known to interact with volatile anesthetics agents as well as cardiac glycosides causing cardiac dysrhythmias.

Garlic has been used for centuries for its medicinal properties. It has been marketed for its antiplatelet, antioxidant, and antihypertensive effects. Some literature suggests that it may lower cholesterol as well, but this statement's validity has been recently challenged. Garlic contains an active component named ajoene that inhibits collagen induced platelet aggregation. Due to its antiplatelet properties, patients taking garlic should be monitored for increased bleeding time and interactions with other anticoagulants including non-steroidal anti-inflammatory drugs (NSAIDs). Theoretically there is an increased risk of perioperative bleeding in patients who take garlic, and the anesthesia provider should be aware of such risk.

Ginkgo biloba has many promising effects on health, particularly in regards of the nervous system and cognitive disorders. Some practitioners find it as a helpful adjunct in Alzheimer treatments (Park et al., 2012). It also has anti-platelet activity and can exacerbate blood loss in a surgical setting. Most data is anecdotal regarding the risk of bleeding, however the potential is very real. Many older patients undergoing surgery are on some form of anti-platelet therapy, including baby aspirin. This can have detrimental effects when coupled with Ginkgo biloba. Blood loss in the operating room is often a manageable known complication of surgery, however if an unknown interaction precipitates, more blood loss could lead to severe complications. Ginkgo biloba has the potential to reduce the effectiveness of nicardipine, a calcium channel blocker frequently used in cardiac surgery, by inhibiting the cytochrome P450 system responsible for nicardipine metabolism (Tachjian, 2010).

Diabetics are a vulnerable population at risk for interactions with Ginkgo biloba. This herbal supplement may be utilized in this population to treat peripheral neuropathies that are associated with diabetes, but can lead to very low blood sugar levels when coupled with anti-

diabetic oral medications. There is a synergistic effect with these medications leading to increased hypoglycemia (Tachjian, 2010).

Wong and Townley (2011) studied Ginseng and its anesthetic management of patients taking ginseng. Ginseng is used for mood enhancement, immunomodulation, and as an aphrodisiac. It is also known to have antioxidant and hypoglycemic activity as well. Adverse effects of ginseng include hypertension, insomnia, headache, vomiting, and epistaxis (Frost, 2006). Hypertension is a serious side effect of prolonged Ginseng use and the anesthetist should monitor the patient for signs and symptoms of undiagnosed hypertension such as end-organ damage, volume depletion, and autonomic instability. Perioperative hemodynamics should be vigilantly monitored as anesthetic drugs cause profound vasodilation and many patients are often volume depleted leading to profound hypotension. Ginseng's use should be avoided in patients taking warfarin, aspirin, and NSAID as it increases the risk for bleeding perioperatively. Blood glucose should be monitored intra-operatively for hypoglycemic episodes, especially in the patients who are high risk which include neurosurgical patients receiving steroids and patients with diabetic end stage renal disease.

Kava is popularly used for its anxiolytic and sedative properties. It is known to potentiate gamma-aminobutyric acid (GABA) neurotransmission and have an agonistic effect on these receptors, which are the active site of many clinically important agents such as benzodiazepines, barbiturates, and possibly volatile anesthetics (Felgentreff et al., 2012). Other qualities that have been attributed to Kava are analgesic, anesthetic, anti-convulsive, and local anesthetic properties (Frost, 2006). Kava can cause serious side effects including hepatotoxicity, dermatological changes such as ichthyosiform dermapathy, and hallucinations. Since its mechanism of action is known to potentiate GABA transmission, the anesthesia provider should be aware of the additive



effects of barbiturates and benzodiazepines. Kava, which has a half-life of nine hours, should be discontinued at least or for more than 24 hours before surgery in order to avoid interactions with anesthesia (Ang-Lee et al., 2010).

Saw palmetto is of particular interest to the aging male population as it is used as treatment for benign prostatic hypertrophy (BPH) and has also historically been used by Native Americans to treat urinary symptoms (Rudra et al., 2008). Steroids and free fatty acids are thought to be the active components of this herb, which in high doses can lead to pancreatitis and cholestatic hepatitis (Batra & Rajeev, 2007). It has been shown to inhibit alpha-1 adrenergic receptor to help alleviate the symptoms of BPH (Tachjian et al., 2010). This can be a danger for surgical operations because saw palmetto also inhibits cyclooxygenase, which can help with inflammation but can hinder blood clot formation. Side effects may include headaches and gastrointestinal symptoms (Rudra et al., 2009). Although limited research cannot support acute discontinuation of Saw palmetto prior to surgery, caution should still be used because of the potential for pharmacokinetic alterations (Rudra et al., 2009).

St. John's Wort is a commonly used herbal supplement in Western medicine used to treat depression and anxiety. Tachjian et al. (2010) declares it one of the top ten herbs used in the USA today. Its mechanism of action is thought to involve inhibition of serotonin, norepinephrine, and dopamine re-uptake. Because of this, there is a potential to cause serotonin syndrome by concurrently taking St. John's Wort with other drugs that also increase plasma serotonin concentration. These drugs include serotonin reuptake inhibitors, monoamine oxidase inhibitors, and  $\beta$ -sympathomimetic amines (Frost, 2006). Increased plasma serotonin, which can be potentially life threatening, is characterized by muscle rigidity, hypertonicity, myoclonus,

autonomic dysfunction, hypertension, and even death. Astute practitioners would be wise to recognize the potential for this severe interaction.

Wong and Townley (2011) noted that St John's Wort is also a potent inducer of the cytochrome P450 3A4 isoform. This isoform is responsible for the metabolism of greater than fifty percent of prescription medication (Wong & Townley, 2011). Drugs dependent on this enzyme for metabolism, such as alfentanil, fentanyl, midazolam, and lidocaine all will demonstrate decreased plasma concentrations. It also affects the CYP 2C9 isoform and this may reduce the effects of NSAIDs and warfarin when St John's Wort is taken with these medications. In addition to its sedative properties, St. John's Wort may delay emergence by potentiating the effects of anesthetic agents (Wong & Townley, 2011).

Valerian has been commercialized for its sedative and anxiolytic properties. It is frequently used for the treatment of insomnia and many over the counter sleep aids contain some form of Valerian (Ang-Lee et al., 2010). The primary mechanism of action in which Valerian produces sedation and hypnosis is by inhibiting the breakdown and reuptake of the GABA neurotransmitter (Wong & Townley, 2011). Side effects include: tremors, headaches, hepatic dysfunction, and cardiac disturbances. Since patients can become physically dependent on Valerian, the anesthesia provider should be vigilant for signs and symptoms of withdrawal due to the abrupt discontinuation of this herb. Tapering the dose over several days would be a prudent strategy of discontinuing the usage of valerian. Concomitant use with sedatives and anxiolytics has been strongly discouraged in recent reviews (Rowe & Baker, 2009).

In conclusion, it is evident from the current literature that there is potential for harm to patients undergoing anesthesia while simultaneously taking herbals. It is the anesthesia provider's duty to protect the patient from adverse interactions. As herbal medicine consumption

continues to increase, anesthesia providers should become accustomed with their usage and possible intraoperative complications. Familiarity with their mechanism of action and the current literature recommendations, demonstrates an ideal anesthetic evidence based practice.

### **Project Description**

This capstone project intention was to educate anesthesia providers about possible herbal interactions with anesthesia, specifically the nine most common hazardous preparations. After extensive research a learning module was designed to facilitate a learning environment that was both informative and easy to use. The education module in the form of a Power Point presentation (Appendix A) was assembled to reflect current data regarding the interactions of the herbs with anesthesia. A brief history of herbs was also included. Audio voice over was a component of this module to help guide the participant through the presentation. Our literature review was embedded in the content of the presentation, and significant statistics were cited within the module when appropriate.

The module consisted of 72 slides, each with audio guides and a thoughtful flow sequence of the material. It was designed to take the participant around one hour to complete the module. It is a click-through fashion presentation, so the participant does not feel rushed through the material and could take as much time on any one slide as they needed. The back feature was enabled. A short 20-question quiz was designed with the intent to validate the participant's comprehension and knowledge recall after viewing the presentation (Appendix B). All answers to the questions could be found within the module.

The goal was to submit this Power Point to the American Association of Nurse Anesthetists (AANA) learn site, which was accomplished in December 2014. While this module

was well received, the AANA did not accept it into publication to the learn site at this time. This was not criterion for completion of this capstone project. The intended goal was achieved.

### **Evaluation Plan**

The measurable outcomes for this project have been met and include:

The power point presentation was submitted to the AANA learn website for publication. Communication was maintained with the AANA spokesperson, Bruce Schoneboom CRNA, PhD, (see Appendix C) from the continuing education department of AANA to ensure adherence to the guidelines for publication on their learn website. All communication was conducted through emails to ensure clear understanding and to provide a record of receipt. All guidelines were met, and submission was received in December 2014.

The AANA participants of the learning module were provided a 20-question quiz at the end of the module. Since this module is being submitted for the continuing education needs of the AANA community, it is necessary for module users to receive appropriate credit for their efforts to contribute towards the renewal of their licensure.

The submission of our module and questions were completed, however acceptance as a learn site AANA module was not granted. Non-acceptance was not based on the authors' status as students. Successful completion of the capstone project was to be determined by the submission of the project to the AANA. This was completed on December 18, 2014.

### **Results and Conclusions**

The consensus remains clear when herbals as related to anesthesia care are discussed; more exposure is needed for the anesthesia provider. *Herbal Medicine in Anesthesia* (Appendix A), the Power Point that was developed throughout this capstone project is now a tool to help

educate anesthesia providers about herbal usage among patients, at least the top nine that are most frequently used. The unintended interactions among herbals and anesthetic medications will continue to occur if the knowledge gap continues. Our attempt at closing this was a productive start.

Implications derived from current articles highlight the frequency of herbal use is increasing but again the education surrounding them is lacking. Patients frequently seek answers from physicians and care providers, however the evidence suggests that patients are not discussing herbal use with their physicians. This is a problem that can be easily resolved, and it starts with the provider asking patients about their herbal consumption prior to surgery. Including questions regarding herbs in the pre-op questionnaire would provide a simple starting point in bridging the gap of knowledge, for both the patient and provider.

Patients undergoing anesthesia are especially vulnerable to the interaction of herbals, some which may be deadly. A working knowledge of herbals and their interaction with anesthetics and drugs used in surgery would increase patient safety immensely. Our learning module *Herbal Medicine in Anesthesia* is our best attempt at mitigating this current practice problem. A better outcome for patients is always the goal of providers, and this capstone project has allowed us to contribute to the solution.

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## Appendix A

<h2>HERBAL MEDICINE IN ANESTHESIA</h2> <p>Sara Geyer BSN, RNPA Edgar Dennis BSN, RNPA</p>	<h3>Objectives</h3> <ul style="list-style-type: none"><li>Identify the top nine herbal hazards in anesthesia</li><li>Review the history of herbal medicine</li><li>Discuss herbal mechanism of actions and side effects</li><li>Discuss herbal interactions with anesthetics and drugs used in surgery</li><li>Raise awareness for anesthesia providers regarding herbal usage among surgical patients</li></ul>	<h3>Case Scenario</h3> <p>Mr. Johnson is pre-op fasting waiting for surgery</p> <p>CRNA and Mr. Johnson meet for the first time</p> <p>CRNA develops best plan of anesthesia for Mr. Johnson</p>	<h3>Case Scenario</h3> <p>Surgeon discusses Mr. Johnson's case with CRNA</p> <p>CRNA overlooks surgeon's discussion</p> <p>Mr. Johnson's disclosure of health with recent new herbal consumption</p>	<h3>Case Scenario</h3> <p>CRNA reports to clarify all medications Mr. Johnson was taking, including herbs</p> <p>CRNA educated Mr. Johnson on importance of disclosing all medications</p> <p>The anesthesia plan was changed</p>	<h3>Introduction</h3> <p>According to the National Institute of Health's Office of Dietary Supplements, herbs are plants or parts of plants that are used to maintain or improve health.</p> <p>Herbal supplements have been used for centuries, and their use in western societies is increasing with alarming frequency</p> <p>NIH National Institutes of Health Office of Dietary Supplements</p>	<h3>History of Herbs</h3> <p>Herbal medicine and modern medicine are inextricably intertwined</p> <p>Many drugs today were derived from plants</p> <table><thead><tr><th>Plant</th><th>Drug</th></tr></thead><tbody><tr><td>Willow bark &amp; salicylates</td><td>Aspirin</td></tr><tr><td>Opium</td><td>Morphine</td></tr><tr><td>Atropa belladonna</td><td>Atropine</td></tr><tr><td>Scopolamine</td><td>Scopolamine</td></tr><tr><td>Quinine</td><td>Quinine</td></tr><tr><td>Quinine</td><td>Quinine</td></tr><tr><td>Quinine</td><td>Quinine</td></tr><tr><td>Quinine</td><td>Quinine</td></tr><tr><td>Quinine</td><td>Quinine</td></tr><tr><td>Quinine</td><td>Quinine</td></tr></tbody></table>	Plant	Drug	Willow bark & salicylates	Aspirin	Opium	Morphine	Atropa belladonna	Atropine	Scopolamine	Scopolamine	Quinine	Quinine	Quinine	Quinine	Quinine	Quinine	Quinine	Quinine	Quinine	Quinine	Quinine	Quinine
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<h3>History of Herbal Medicine</h3> <p>Ancient Egypt, Greece, India, and Mesopotamia had written records of herbs used for medicinal purposes</p> <p>Egyptian physicians of the 1st and 2nd century B.C. used herbs to treat constipation and digestive disorders</p> <p>The book of Ebers is the oldest record of herbal medicine</p> <p>"The first and best of herbs, and the best of all for mankind"</p>	<h3>History of Herbal Medicine</h3> <p>Placitius, a Greek physician of the 2nd century B.C., wrote the first known medical text on herbs</p> <p>The book of Ebers is the oldest record of herbal medicine</p> <p>"The first and best of herbs, and the best of all for mankind"</p>	<h3>History of Herbal Medicine</h3> <p>Francis Adams - noted that early century physicians were in to use herbs for medicinal purposes in the 10th century</p> <p>Only minor changes occurred over 1500 years regarding the indications, effects, and drug interactions practitioners physicians had documented</p>	<h3>History of Herbal Medicine</h3> <p>Home grown botanicals and herbs were medicinal available during the Middle Ages</p> <p>Herbal healing has passed down for years of word throughout generations</p>	<h3>History of Herbal Medicine</h3> <p>Physician Nicholas Culpeper wrote the first available manual - a layperson could use for healthcare by the 17th century</p> <p>Guide to Natural Medicines Textbook, published by the Pharmacy Desk Reference, is a textbook of herbs and updated annually</p>	<h3>Trends of Herbal Usage</h3> <p>From 1990-1997, the use of herbal supplements increased 30% in the United States (Ginsberg et al., 1998)</p> <p>More than 15 million adults reported combining herbal supplements with prescription medications</p>																							
<h3>Trends of Herbal Usage</h3> <p>Several reasons for the increasing interest in herbal supplements may be because:</p> <ol style="list-style-type: none"><li>The use of Western medicine may not always deliver good results</li><li>The increase in travel and exposure to other cultures has renewed many traditions and ancient therapies</li><li>The rising cost of health care may force patients to seek less expensive therapies</li></ol>	<h3>Co-administration of Herbs</h3> <ul style="list-style-type: none"><li>Herbal products have intrinsic pharmacological activity and side effects that when combined with medications can have severe adverse effects</li><li>Ruz &amp; Mahabadi (2014) found that one out of every six patients take some type of dietary supplement together with prescribed medications</li><li>70% of those taking herbal supplements fail to tell their physicians</li></ul>	<h3>Government Regulation</h3> <p>Herbal products are a unique class of dietary supplements because they are derived from medicinal plants but not regulated in the US</p> <p>The Food and Drug Administration (FDA) does not hold herbal remedies to the same standards and regulations as pharmaceutical industry</p>	<h3>Government Regulation</h3> <p>Dietary Supplement Health and Education Act of 1994</p> <ul style="list-style-type: none"><li>Exempted dietary supplements including herbal preparations from FDA oversight</li><li>The Food and Drug Administration (FDA) does not hold herbal remedies to the same standards and regulations as pharmaceutical industry</li></ul>	<h3>Recommendations</h3> <p>Due to the lack of research, the American Society of Anesthesiologists (ASA) has determined that there is insufficient data to provide exact dosage recommendations for individual herbs</p> <p>The American Society of Anesthesiologists urges patients to tell their anesthesiologist about any medications they are taking, including all vitamins, herbal supplements and other alternative substances</p>	<h3>Recommendations</h3> <ul style="list-style-type: none"><li>ASA recommendations</li><li>Asking the patient to physically bring all substances, including prescription and over-the-counter, the day of surgery</li><li>Ask patients to stop taking these supplements two weeks prior surgery</li></ul>	<h3>Vulnerable Populations</h3> <ul style="list-style-type: none"><li>Elderly</li><li>Children</li><li>Pregnant</li><li>Immune compromised</li></ul>																						
<h3>Review of Literature</h3> <p>We look to peer reviewed journal articles to answer some of the most common questions regarding herbs</p> <p>What is the most current body of knowledge regarding herbs in anesthesia?</p> <p>Who is at risk?</p> <p>What medical settings are herbs dangerous?</p> <p>What are patients taking?</p> <p>What herbs are the most common?</p> <p>Who knows about herbal usage and why or why not?</p>	<h3>Use of Herbal Products and Potential Interactions in Patients With Cardiovascular Diseases</h3> <p>Tashjian et al. (2010)</p> <p>Highlighting a vulnerable population to watch over because of their concurrent use of herbs and pharmacological medications</p> <p>"The use of herbal supplements is prevalent among patients who are taking prescription medications, particularly senior citizens"</p> <p>Elderly are among the highest population that undergo cardiac surgery</p> <p>Discuss the shift from primary care to alternative care</p> <p>"The total number of visits to complementary and alternative medicine providers has increased three times in primary physicians"</p>	<h3>Perioperative risks and benefits of herbal supplements in anesthetic surgery</h3> <p>Rowe, D. J., &amp; Baker, A. C. (2009)</p> <p>Discussed in reporting</p> <p>40-50% of patients do not tell their primary care physicians about supplement consumption</p> <p>10% of patients do not tell their anesthesiologist about their supplement consumption</p> <p>Need for physicians, surgeons and anesthesia providers to become familiar with herbs and their interactions</p> <p>Recommends that these professionals should be aware of adverse interactions with herbs taken by patients</p> <p>Anesthesia providers specifically should be aware of adverse interactions with herbs taken by patients</p>	<h3>Case reports of adverse effects of herbal medicine products (HMPs): A quality assessment</h3> <p>Hung, S. K., Miller, A. S., &amp; Ernst, E. (2011)</p> <p>Examined the trends of reporting of adverse effects</p> <p>1986-2000</p> <p>2000-2009</p> <p>Case reporting of herbal adverse reactions is improving</p>	<h3>Topical herbal remedies: Research opportunities for plastic surgeons.</h3> <p>Krieger, A., Garg, M., &amp; Chandralekha, R. Y. (2010)</p> <p>Some herbs may be helpful in skin healing processes for regular to deep and frequency of herbal use</p> <p>Side effects not clearly defined</p> <p>None of the herbs used on the skin was granted "A" rating supporting the need for further research</p> <p>Little evidence in favor or against topical herbal remedies in plastic surgery anesthesia specifically, for alone in medicine in general</p>	<h3>Current Problem</h3> <p>Literature suggests that herbs may be helpful in treating a plethora of ailments, possibly more effectively and safely than pharmaceuticals</p> <p>Many consumers believe that herbal medicines are natural and therefore safe, but this is a dangerous assumption</p> <p>Approximately 38 million adults in the US (14.9% of the population) use herbs or other natural substances</p>	<h3>Current Problem</h3> <p>Ang Lee et al. found that herbal interactions with anesthesia are frequent and more among providers</p> <p>Survey conducted in 2005 and published by ANA found:</p> <ul style="list-style-type: none"><li>Only 27% of CRNAs were familiar with the ASA recommendation to discontinue herbal medicine 2 weeks before surgery</li><li>82% stated preoperative items did not have space to document herbal supplement usage</li><li>10% stated they had educational opportunities on anesthesia and herbal supplements</li></ul>																						
<h3>Top nine herbal hazards in anesthesia</h3> <ol style="list-style-type: none"><li>Echinacea</li><li>Ephedra</li><li>Garlic</li><li>Ginkgo biloba</li><li>Ginseng</li><li>Kava</li><li>Saw palmetto</li><li>St. John's wort</li><li>Valerian</li></ol>	<h3>Echinacea</h3> <p>Member of the daisy family which can be found throughout the North American plains, prairies, and meadows</p> <p>There are nine species of Echinacea, but medicinal products are primarily derived from three:</p> <ul style="list-style-type: none"><li>Echinacea purpurea</li><li>Echinacea angustifolia</li><li>Echinacea pallida</li></ul>	<h3>Echinacea</h3> <p>Used to prevent and treat bacterial, viral, and fungal infections</p> <p>Improves immune system by:</p> <ul style="list-style-type: none"><li>Enhanced phagocytosis</li><li>Increased T-cell stimulation</li><li>Modulating cytokine signaling</li></ul>	<h3>Echinacea</h3> <p>Immunostimulatory effects may offset immunosuppressive properties of corticosteroids or cyclosporine → exacerbated in patients with systemic and autoimmune disorders</p> <p>Inhibits hepatic enzymes → risk for toxicity in drugs metabolized by liver (phenytoin, rifampin, barbiturates)</p> <p>Chronic use can result in hepatic failure</p>	<h3>Echinacea</h3> <p>Immunostimulatory effects may offset immunosuppressive properties of corticosteroids or cyclosporine → exacerbated in patients with systemic and autoimmune disorders</p> <p>Inhibits hepatic enzymes → risk for toxicity in drugs metabolized by liver (phenytoin, rifampin, barbiturates)</p> <p>Chronic use can result in hepatic failure</p>	<h3>Ephedra</h3> <p>Adverse effects:</p> <ul style="list-style-type: none"><li>Nausea</li><li>Headache</li><li>Arrhythmia</li></ul> <p>Anesthesia provider should be aware of the augmented effects of ephedra, especially in patients with pre-existing cardiovascular disease and those who have taken ephedra-containing products</p>	<h3>Ephedra</h3> <p>Used to treat the common cold, bronchitis, fever, asthma, and low blood pressure</p> <p>Increases metabolic rate → included in many over-the-counter weight reduction preparations</p>	<h3>Ephedra</h3> <p>Used to treat the common cold, bronchitis, fever, asthma, and low blood pressure</p> <p>Increases metabolic rate → included in many over-the-counter weight reduction preparations</p>																					
<h3>Ephedra</h3> <ul style="list-style-type: none"><li>Sympathomimetic:           <ul style="list-style-type: none"><li>Direct stimulation of alpha and beta adrenergic receptors</li><li>Indirect increase release of norepinephrine from presynaptic neurons</li></ul></li><li>Long term use may deplete endogenous catecholamines → may precipitate cardiovascular instability and tachycardia in other sympathomimetic drugs (Post, 2006)</li></ul>	<h3>Ephedra</h3> <p>Direct acting sympathomimetic (phenylephrine) must be used to treat intra-operative hypotension</p> <p>Cardiac dysrhythmias can occur when coupled with volatile anesthetics (e.g. halothane) and cardiac glycosides (e.g. digoxin)</p>	<h3>Garlic</h3> <p>One of the most popular herbal remedies used for centuries for its medicinal properties</p> <p>Marketed for its antiproliferative, antioxidant, and antihypertensive effects</p>	<h3>Garlic</h3> <p>Allicin component, appears, inhibits collagen induced platelet aggregation</p> <p>Cysteine, found in garlic, decreases thromboxane formation and alters arachidonic acid metabolism</p> <p>Has been shown to have significant lowering effects on blood pressure</p>	<h3>Garlic</h3> <p>Allicin component, appears, inhibits collagen induced platelet aggregation</p> <p>Cysteine, found in garlic, decreases thromboxane formation and alters arachidonic acid metabolism</p> <p>Has been shown to have significant lowering effects on blood pressure</p>	<h3>Garlic</h3> <p>Allicin component, appears, inhibits collagen induced platelet aggregation</p> <p>Cysteine, found in garlic, decreases thromboxane formation and alters arachidonic acid metabolism</p> <p>Has been shown to have significant lowering effects on blood pressure</p>	<h3>Ginkgo biloba</h3> <p>Used to treat the common cold, bronchitis, fever, asthma, and low blood pressure</p> <p>Increases metabolic rate → included in many over-the-counter weight reduction preparations</p>	<h3>Ginkgo biloba</h3> <p>Used to treat the common cold, bronchitis, fever, asthma, and low blood pressure</p> <p>Increases metabolic rate → included in many over-the-counter weight reduction preparations</p>																					
<h3>Ginkgo biloba</h3> <ul style="list-style-type: none"><li>Used medicinally for thousands of years as an:           <ul style="list-style-type: none"><li>Antioxidant</li><li>Cerebral stimulant</li><li>Treatment for circulatory disorders</li><li>Diuretic</li><li>Verapamil</li><li>Menstrual enhancement</li><li>Sexual dysfunction</li></ul></li><li>Flavonoids, active compounds found in Ginkgo, give it its antioxidant and free radical scavenging ability</li></ul>	<h3>Ginkgo biloba</h3> <ul style="list-style-type: none"><li>Many effects on health, particularly in regards to the nervous system and cognitive disorders</li><li>Helpful adjunct in Alzheimer's treatment</li></ul>	<h3>Ginkgo biloba</h3> <p>Adverse effects:</p> <ul style="list-style-type: none"><li>May cause bleeding</li><li>Headache</li></ul> <p>Ginkgo inhibits platelet activating factor (PAF) receptor antagonist → exacerbates blood loss in surgery</p> <p>Avoid concurrent use with antiplatelet drugs → decreases effectiveness of agents</p> <p>Avoid taking with tricyclic antidepressants (TCAs) as it might potentiate the seizure threshold lowering actions of these drugs</p>	<h3>Ginkgo biloba</h3> <ul style="list-style-type: none"><li>Used in diabetic population to treat peripheral neuropathy</li><li>Synergistic effect with antiplatelet medications → increased risk of bleeding</li></ul>	<h3>Ginseng</h3> <ul style="list-style-type: none"><li>Used for mood enhancement, immunomodulation, and as an aphrodisiac</li><li>Also has antioxidant and hypoglycemic activity</li><li>Adverse effects include: hypertension, insomnia, headache, vomiting, and constipation</li></ul>	<h3>Ginseng</h3> <ul style="list-style-type: none"><li>Used for mood enhancement, immunomodulation, and as an aphrodisiac</li><li>Also has antioxidant and hypoglycemic activity</li><li>Adverse effects include: hypertension, insomnia, headache, vomiting, and constipation</li></ul>	<h3>Ginseng</h3> <p>Hypertension is a serious side effect of prolonged Ginseng use</p> <p>Monitor patients for signs of undiagnosed hypertension:</p> <ul style="list-style-type: none"><li>End-organ damage</li><li>Volume depletion</li><li>Adverse reactivity</li></ul>	<h3>Ginseng</h3> <p>Hypertension is a serious side effect of prolonged Ginseng use</p> <p>Monitor patients for signs of undiagnosed hypertension:</p> <ul style="list-style-type: none"><li>End-organ damage</li><li>Volume depletion</li><li>Adverse reactivity</li></ul>																					
<h3>Ginseng</h3> <ul style="list-style-type: none"><li>Perioperative hemodynamics should be vigilantly monitored as anesthetic drugs cause profound vasodilation and many patients are often volume depleted leading to profound hypotension</li><li>Avoid concurrent use of ginseng with Monoamine Oxidase Inhibitors (MAOIs) because toxic episodes have been reported</li></ul>	<h3>Ginseng</h3> <ul style="list-style-type: none"><li>Avoid use of Ginseng in patients taking warfarin, aspirin, and NSAIDs → increased risk for bleeding and hypotension</li><li>Blood glucose should be monitored intra-operatively for hypoglycemic episodes in high risk patients:           <ul style="list-style-type: none"><li>Diabetes mellitus</li><li>Insulin therapy</li><li>Diabetes insipidus</li></ul></li></ul>	<h3>Kava</h3> <p>Kava is derived from the dried root of the pepper plant family</p> <p>Used for its anxiolytic and sedative properties</p> <p>The active ingredients called kavalactones, have central muscle-relaxing properties and anxiolytic activity</p>	<h3>Kava</h3> <p>Kava is derived from the dried root of the pepper plant family</p> <p>Used for its anxiolytic and sedative properties</p> <p>The active ingredients called kavalactones, have central muscle-relaxing properties and anxiolytic activity</p>	<h3>Kava</h3> <p>Potentiates gamma-aminobutyric acid (GABA) neurotransmission, producing an anxiolytic effect on these receptors</p> <p>Other properties include:</p> <ul style="list-style-type: none"><li>Anxiolytic</li><li>Sedative</li><li>Muscle relaxant</li><li>Local anesthetic properties</li></ul>	<h3>Kava</h3> <p>Serious side effects include: hepatotoxicity, dermatological changes, hallucinations, and anticholinergic-like adverse reactions</p> <p>Since it potentiates GABA transmission, the anesthesia provider should be aware of the additive effects with anesthetics</p> <p>Kava, which has a half-life of nine hours, should be discontinued for at least 24 hours before surgery in order to avoid interactions with anesthesia</p>	<h3>Saw palmetto</h3> <p>Used to treat the common cold, bronchitis, fever, asthma, and low blood pressure</p> <p>Increases metabolic rate → included in many over-the-counter weight reduction preparations</p>	<h3>Saw palmetto</h3> <p>Used to treat the common cold, bronchitis, fever, asthma, and low blood pressure</p> <p>Increases metabolic rate → included in many over-the-counter weight reduction preparations</p>																					
<h3>Saw palmetto</h3> <ul style="list-style-type: none"><li>Used in the aging male population for treatment of benign prostatic hyperplasia</li><li>Shown to inhibit alpha-1 adrenergic receptors</li><li>Inhibits cyclooxygenase, which can help with information but hinder blood clot formation</li></ul>	<h3>Saw palmetto</h3> <ul style="list-style-type: none"><li>Steroids and free fatty acids are thought to be the active components of this herb, which in high doses can lead to pericarditis and cholelithiasis</li><li>Side effects include: headache and GI symptoms</li><li>Although limited research cannot support acute discontinuation of Saw palmetto prior to surgery, caution should still be used because of the potential for pharmacokinetic alterations</li></ul>	<h3>St. John's wort</h3> <ul style="list-style-type: none"><li>One of the top ten herbs used according to the latest survey, USA Today</li><li>Used to treat depression and anxiety</li><li>Used to treat depression and anxiety</li><li>Thought to inhibit serotonin, norepinephrine, and dopamine re-uptake</li></ul>	<h3>St. John's wort</h3> <ul style="list-style-type: none"><li>One of the top ten herbs used according to the latest survey, USA Today</li><li>Used to treat depression and anxiety</li><li>Used to treat depression and anxiety</li><li>Thought to inhibit serotonin, norepinephrine, and dopamine re-uptake</li></ul>	<h3>St. John's wort</h3> <p>Side effects:</p> <ul style="list-style-type: none"><li>Photosensitivity</li><li>Dizziness</li><li>Headache</li><li>Constipation</li><li>Nausea</li></ul> <p>Photosensitization drugs (e.g., phenytoin and tetracycline) should be avoided</p>	<h3>St. John's wort</h3> <p>Potential to cause serotonin syndrome by concurrently taking St. John's wort with other drugs that also increase plasma serotonin concentration</p> <p>These drugs include: selective serotonin reuptake inhibitors (SSRIs) and serotonin reuptake inhibitors (SARIs)</p> <p>SSRIs and SARIs include:</p> <ul style="list-style-type: none"><li>Fluoxetine</li><li>Paroxetine</li><li>Citalopram</li><li>Escitalopram</li><li>Desipramine</li><li>Nortriptyline</li><li>Imipramine</li><li>Doxepin</li></ul>	<h3>St. John's wort</h3> <p>A potent inducer of cytochrome P450 3A4 isoform, which is responsible for the metabolism of more than 50% of prescribed medications</p> <p>Decreasing plasma concentrations of alfentanil, fentanyl, midazolam, and fentanyl</p> <p>Also affects CYP 3C4 isoform, which can reduce the effects of NSAIDs and warfarin</p> <p>St. John's Wort may delay emergence by potentiating the effects of anesthetic agents</p>	<h3>St. John's wort</h3> <p>A potent inducer of cytochrome P450 3A4 isoform, which is responsible for the metabolism of more than 50% of prescribed medications</p> <p>Decreasing plasma concentrations of alfentanil, fentanyl, midazolam, and fentanyl</p> <p>Also affects CYP 3C4 isoform, which can reduce the effects of NSAIDs and warfarin</p> <p>St. John's Wort may delay emergence by potentiating the effects of anesthetic agents</p>																					
<h3>Valerian</h3> <ul style="list-style-type: none"><li>Commercialized for its sedative and anxiolytic properties</li><li>Used for treatment of insomnia</li><li>Many over-the-counter sleep aids contain some form of Valerian</li></ul>	<h3>Valerian</h3> <ul style="list-style-type: none"><li>Commercialized for its sedative and anxiolytic properties</li><li>Used for treatment of insomnia</li><li>Many over-the-counter sleep aids contain some form of Valerian</li></ul>	<h3>Valerian</h3> <p>Primary mechanism of action is by inhibiting the transmission and regulation of the GABA neurotransmitter</p> <p>Patients can become physically dependent</p> <p>Tapering the dose over several days is recommended because abrupt discontinuation can lead to a loss of withdrawal</p>	<h3>Valerian</h3> <p>Side effects include:</p> <ul style="list-style-type: none"><li>Drowsiness</li><li>Headache</li><li>Constipation</li><li>Central nervous system depression</li></ul> <p>Concurrent use with sedatives and anxiolytics has been strongly discouraged in literature</p>	<h3>Summary</h3> <ul style="list-style-type: none"><li>The consumption of herbal supplements in Western societies is increasing</li><li>It is evident from the current literature that there is potential for herb-drug interactions, especially when administered with anesthesia</li><li>Many patients taking herbal supplements fail to tell their physicians about their consumption</li><li>It is our duty as Certified Registered Nurse Anesthetists to protect the patient from adverse interactions</li></ul>	<h3>Conclusion</h3> <ul style="list-style-type: none"><li>As herbal medicine consumption continues to increase, anesthesia providers should become acquainted with their usage and possible interpretative complications</li><li>Inquiry of herb-drug interactions must be a routine component of preoperative assessment</li><li>Familiarity with common herb mechanisms of action and knowledge of current literature recommendations demonstrates an anesthesia provider's best practice, which is clear for our patients</li></ul>	<h3>Thank you</h3>	<h3>Thank you</h3>																					



## Appendix B

## Top Nine Herbal Hazards in Anesthesia

Sara Geyer BSN, SRNA & Edgar Osorio BSN, SRNA

Quiz questions (correct answers highlighted):

1. Which drugs are considered inducers of the CYP metabolism system? (pick 2)
  - a. St. John's Wort
  - b. Ephedra
  - c. Valerian
  - d. Ginkgo biloba
2. Hypoglycemia is a potential side effect in diabetic patients when these herbals are used. (Pick 2)
  - a. Ginkgo biloba
  - b. Garlic
  - c. Ginseng
  - d. Ginger
3. These drugs have anti-platelet activity (pick 3)
  - a. Ginkgo biloba
  - b. Saw Palmetto
  - c. Echinacea
  - d. Garlic
  - e. Ginseng
4. T/F: Ginkgo Biloba can reduce the effectiveness of Nicardipine. True
5. Which herbal can be used for the treatment of Alzheimer's?
  - a. Valerian
  - b. St. John's Wort
  - c. Ginkgo biloba
  - d. Kava
6. Which herbal mimics the effects of Ephedrine?
  - a. Garlic
  - b. Ephedra
  - c. Feverfew
  - d. Saw Palmetto
7. This herb has immunostimulatory effects, and is contraindicated in pt with autoimmune disorders.

- a. Garlic
  - b. Ephedra
  - c. Echinacea
  - d. Ginseng
8. Caution should be taken with this herb in cardiac patients taking cardiac glycosides.
- a. Ephedra
  - b. Saw Palmetto
  - c. Valerian
  - d. Kava
9. These herbs mimic gamma-aminobutyric acid (GABA) effects and may slow emergence.
- a. Kava
  - b. Ginseng
  - c. Ginkgo biloba
  - d. Valerian
10. A male patient with benign prostatic hypertrophy would most likely be on which herb discussed in this presentation?
- a. Ginkgo biloba
  - b. Saw Palmetto
  - c. Garlic
  - d. Ginseng
11. This herb increases plasma serotonin concentration. Anesthesia practitioners should watch for serotonin syndrome in patients taking this herb.
- a. St. John's Wort
  - b. Echinacea
  - c. Ephedra
  - d. Ginger
12. This herb is a potent inducer of cytochrome isoform P450 3A4, this isoform is responsible for the metabolism of greater than fifty percent of prescription medication.
- a. Valerian
  - b. St. John's Wort
  - c. Ginkgo biloba
  - d. Rosemary
13. Many over the counter sleep aids contain some form of this herb.
- a. Kava
  - b. Valerian
  - c. Chamomile
  - d. Rose

14.

MOA

Drug

Inhibition of serotonin, Norepinephrine And dopamine re-uptake	Ephedra
Sympathomimetic. Direct alpha and beta stimulation and indirect increase of norepinephrine from presynaptic neurons	Echinacea
Modulates cytokine signaling	St. John's Wort
GABA agonist	Kava

15. Patients that consume these herbs can exhibit a delay in emergence from anesthesia because of the sedative properties. (pick 3)

- St John's Wort
- Valerian
- Garlic
- Echinacea
- Kava

16. Increased bleeding risk should be anticipated for patients taking these herbs, and caution should be taken with NSAID usage perioperatively. (pick 3)

- Ginkgo biloba
- Saw Palmetto
- Echinacea
- Garlic
- Ginseng

17. Current literature states that up to \_\_\_\_\_% of patients do not report herbal usage to their health care provider.

- 10
- 20
- 70
- 100

18. Side Effects of this herb include: tremors, headaches, hepatic dysfunction and cardiac disturbances.

- Valerian
- Thyme
- Garlic
- Ginger

19. Long term usage of this herb may deplete endogenous catecholamines leading to intra-operative cardiovascular instability and tachyphylaxis to other sympathomimetic drugs.

- a. St. John's Wort
- b. Echinacea
- c. Ephedra
- d. Ginger

20. American Society Anesthesiologist (ASA) recommends: (pick 2)

- a. Stopping herbal supplements two weeks prior to surgery
- b. Any patient who takes herbs should not have surgery
- c. Asking patient to bring the supplements to the preoperative evaluation
- d. Take the herbal supplements the day of surgery

## Appendix C

Bruce Schoneboom <bschoneboom@aana.com>  
Thu 12/18/2014 9:14 PM  
Inbox  
To:  
Edgar Osorio <edgarosorio16@gmail.com>;  
Cc:  
Geyer, Sara;  
Bruce Schoneboom <bschoneboom@aana.com>;  
You forwarded this message on 12/18/2014 9:41 PM.  
Edgar and Sara,

Thank you for your submission of your Capstone Project “Herbal Medicine in Anesthesia” to the AANA. This email can be used to validate that your project has been submitted. However, AANA has already developed extensive resources on this topic for CRNAs and patients. We have conducted an internal review and although, as you state, there is a knowledge gap about these products with anesthesia providers your presentation does not meet the standards for posting as a continuing education course on AANA Learn. I applaud your efforts and want to congratulate you on a successful completion of your Capstone project.

Here are a few resources developed by AANA for patients regarding herbal supplements:

<http://www.aana.com/forpatients/Pages/Herbal-Products-and-Your-Anesthesia.aspx>

[http://www.aana.com/forpatients/Documents/herbal\\_english.pdf](http://www.aana.com/forpatients/Documents/herbal_english.pdf)

[http://www.aana.com/newsandjournal/Documents/herbal0202\\_p47-51.pdf](http://www.aana.com/newsandjournal/Documents/herbal0202_p47-51.pdf)

*Bruce*

**Bruce A. Schoneboom, CRNA, PhD, FAAN**  
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**Education and Professional Development**

**American Association of Nurse Anesthetists | “Safe and Effective Anesthesia Care”**

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## Appendix D



ADVENTIST UNIVERSITY  
OF HEALTH SCIENCES  
*Florida Hospital's University*

## Top 9 Herbal Hazards in Anesthesia

Sara Geyer BS, BSN, SRNA & Edgar Osorio BSN, SRNA

Project Mentor: Jerry Merrell, MD, USAP

Committee Chair: Manuel Tolosa, DNAP, CRNA

Nurse Anesthesia Program, Adventist University of Health Science

### ABSTRACT

Herbs are products made from plants used to treat disease or improve quality of life. Herbal supplements have been used for centuries, and their use is increasing. Herbal products have intrinsic pharmacological activity and side effects that when combined with medications can have severe adverse effects.

With the increasing use of herbal supplements and patients' failure to mention them to providers, there is a definite need to ask patients pre-operatively for their use of supplements to prevent potential adverse events.

Due to the lack of research, the American Society of Anesthesiologists has determined that there is insufficient data to provide exact dosage recommendations for individual herbs.

Therefore, we have reviewed the literature to examine the safety, pharmacodynamics, and pharmacokinetics of the top nine herbs most frequently seen among patients.


### INTRODUCTION

From 1990-1997, the use of herbal supplements **increased** 380% in the United States (US)

Herbal products have intrinsic pharmacological activity and side effects that when combined with medications can have severe adverse effects

Rutz & Maldonado (2014) found that one out of every six patients takes some type of dietary supplement together with prescribed medications

70% of those taking herbal supplements fail to tell their physicians



### REGULATIONS & RECOMMENDATIONS

The Food and Drug Administration (FDA) does not hold herbal remedies to the same standards and regulations as the pharmaceutical industry

Dietary Supplement Health and Education Act of 1994

Exempted dietary supplements including herbal preparations from FDA oversight

This allowed herbal supplements to be offered publicly without premarketing approval or submission to the FDA

Due to the lack of research, the American Society of Anesthesiologists (ASA) has determined that there is insufficient data to provide exact dosage recommendations for individual herbs

ASA recommendations:

1. Ask the patient to physically bring all substances, including prescription and over-the-counter, the day of surgery
2. Ask patients to stop taking these supplements two weeks prior surgery

### REVIEW OF LITERATURE

#### TOP 9 HERBALS ASSOCIATED WITH ANESTHETIC IMPLICATIONS

1. Ephedra	6. Kava
2. Ginkgo	7. Saw Palmetto
3. Garlic	8. St. John's Wort
4. Ginkgo biloba	9. Valerian
5. Ginseng	

**Echinacea** - Promoted to prevent and treat bacterial, viral, and fungal infections. Known to cause inhibition of hepatic microsomal enzymes, caution should be used when administering phenytoin, rifampin, and barbiturates as toxicity can quickly develop.

**Ephedra** - Treats the common cold, bronchitis, fever, asthma, and low blood pressure. Ephedra is a sympathomimetic. Long-term use of Ephedra depletes endogenous catecholamines leading to intra-operative cardiovascular instability and tachyphylaxis to other sympathomimetic drugs. Interacts with volatile anesthetics agents as well as cardiac glycosides causing cardiac dysrhythmias.

**Garlic** - Has antiplatelet, antioxidant, and antihypertensive effects. Active component named ajoene that inhibits collagen-induced platelet aggregation. Increases bleeding time & risk of perioperative bleeding.

**Ginkgo biloba** - Used for nervous system and cognitive disorders. Has antiplatelet activity and can exacerbate blood loss.

**Ginseng** - Blood enhancement, immunomodulation, and an antidiabetic. Hypertension is a serious side effect of prolonged use. Monitor the patient for signs and symptoms of undiagnosed hypertension that may include end-organ damage, volume depletion and autonomic instability. It also increases the risk for bleeding perioperatively.

**Kava** - Anxiolytic and sedative properties. Potentiates GABA neurotransmission; therefore, it has additive effects of both barbiturates and benzodiazepines.

**Saw Palmetto** - Inhibits alpha-1 adrenergic receptor to help alleviate the symptoms of benign prostatic hypertrophy. It also inhibits cyclooxygenase, which can help with inflammation but can hinder blood clot formation. High doses can lead to pancreatitis and cholestatic hepatitis.

**St. John's Wort** - Treats depression and anxiety. Mechanism of action is thought to involve inhibition of serotonin, norepinephrine, and dopamine re-uptake. Induces CYP-3A4 leading to a decrease plasma concentrations of lorazepam, midazolam and fentanyl.

**Valerian** - Sedative and anxiolytic properties. Modulates the breakdown and reuptake of the GABA neurotransmitter. Patients can become physically dependent on Valerian; provider should be vigilant for signs and symptoms of withdrawal.

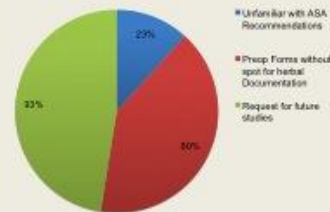
### CURRENT PROBLEM

Approximately 38 million adults in the US (18.9% of the population) use herbs or other natural substance

Studies found 40-70% of patients do not tell their physicians about supplement consumption

Ang-Lee et al. found that herbal interactions with anesthesia are **not** well known among providers

#### 2005 HERBAL SURVEY BY AANA



Category	Percentage
Unfamiliar with ASA Recommendations	33%
Prescription without appropriate documentation	22%
Request for future studies	45%

### CONCLUSIONS

It is evident from the current literature that there is potential for harm to patients undergoing anesthesia while simultaneously taking herbs

Inquiry of herb/drug interactions must be a routine component of preoperative assessment

As herbal medicine consumption continues to increase, anesthesia providers should become accustomed with their usage and possible intraoperative complications

REFERENCES AVAILABLE UPON REQUEST