Published in final edited form as:

Nurs Clin North Am. 2013 March ; 48(1): . doi:10.1016/j.cnur.2012.11.002.

A Systematic Review of Complementary and Alternative Medicine for Asthma Self-management

Maureen George, PhD, RN, AE-C^{a,b,*} and Maxim Topaz, RN, MA^{c,d}

^aDepartment of Family and Community Health, University of Pennsylvania School of Nursing, 418 Curie Boulevard, Philadelphia, PA19104, USA

^bCenter for Clinical Epidemiology and Biostatistics (CCEB), Department of Biostatistics and Epidemiology, Perelman School of Medicine, 837 Blockley Hall, 423 Guardian Drive, Philadelphia, PA 19104–6021, USA

^cUniversity of Haifa, The Cheryl Spencer Department of Nursing Haifa, Mount Carmel 31905, Haifa, Israel

^dUniversity of Pennsylvania School of Nursing, 418 Curie Boulevard, Philadelphia, PA 19104, USA

Keywords

Asthma; Self-management; Patient-provider communication; Complementary and alternative medicine; Mind-body; Natural products; Disclosure

Introduction and Background

It has been more than 3 decades since Arthur Kleinman first reminded clinicians that individuals have more options to treat illness than just conventional biomedical approaches.¹ In fact, the health care professional is often the last resort for patients, consulted only after popular remedies and traditional healing methods have been exhausted.² To that end, it is estimated that as much as 80% of the world's health care is nonbiomedical.³

Although traditional healing is frequently integrated into the national medical system of its endemic country (eg, Ayurveda in India) and is common in places where limited access or prohibitive costs prevent the widespread adoption of biomedicine,³ traditional healing is not an integral component of the North American health care systems. This has led to its characterization as “complementary” or “alternative” medicine. The term *complementary* describes traditional practices used in combination with conventional biomedical approaches, whereas *alternative* connotes traditional practices that replace or substitute for biomedicine.⁴ The goal for many is *integrated* care in which the best treatments from conventional biomedical approaches are combined with safe and effective complementary and alternative medicine (CAM).⁴

The National Center for Complementary and Alternative Medicine (NCCAM), the leading federal CAM research agency in the United States, defines CAM as a variety of medical systems, healing traditions, and products not typically considered to be part of conventional biomedical approaches.⁴ As seen in Table 1, CAM can be broadly characterized into

domains that include whole medical systems, natural products, manipulative and body-based practices, movement therapies, traditional healers, and energy field healing. Although useful for purposes of grouping, the clinician must remember that a CAM approach may overlap with several domains.

Despite growing interest in integrated care,⁵ much of CAM continues to be delivered outside of the North American health care systems at a considerable out-of-pocket cost.⁶ In fact, US adults are more likely to use CAM when conventional medical care is unaffordable.⁷ Despite these costs, CAM is widely used. Nationwide surveys suggest that three-quarters of US⁷ and Canadian adults^{5,8} have used some form of CAM in their lifetime. In addition, although there are no national data on CAM use in Mexico, a systematic review indicates high rates of indigenous Mexican CAM use among Mexican-American adults.⁹

Frequently, CAM use is reported to be highest among well-educated higher-income white adults.⁷ However, this is likely a function of survey questions that focus on vitamins and herb ingestion, and body-based (massage, chiropractic care) and mind-body therapies (yoga, acupuncture) to the exclusion of folk medicine and prayer, which are CAMs more commonly used by people of color and by the poor. For example, when folk medicine (defined as a “range of remedies including prayer, healing touch or laying on of hands, charms, herbal teas or tinctures, magic rituals”) was included in the 2002 National Health Interview Survey (NHIS), CAM prevalence was highest in black and Hispanic individuals and those living in poverty.¹⁰ Nonvitamin, nonmineral natural products and deep-breathing exercises were the most commonly reported CAM⁷ after prayer¹⁰ among US adults, whereas chiropractic care, massage, relaxation techniques, and prayer were most common among Canadian adults.⁵ In both groups, CAM was used for the treatment of a variety of somatic and psychiatric complaints, including neck, back, and joint discomfort; upper respiratory infections; anxiety; and depression.^{5,7}

CAM is also frequently used by or for children. The 2006 Fraser Institute⁵ and 2007 NHIS⁷ surveys were the first comprehensive national surveys directed at understanding CAM use among North American children. Caregivers of children aged 0 to 17 were interviewed about the child's CAM use. Twelve percent of US⁷ and 15% of Canadian youth⁵ reported CAM use in the prior 12 months to treat neck and back pain, anxiety, and attention deficit and hyperactivity disorders, as well as head and chest colds.⁷ Children were most likely to use nonvitamin, nonmineral natural products, chiropractic care,^{5,7} homeopathy, and acupuncture.¹¹ CAM use was fivefold higher in children who had a CAM-using parent compared with children who did not.⁷

Complementary and Alternative Medicine for Asthma

Although CAM is commonly used to maintain wellness, national surveys have demonstrated their extensive use in treating common chronic medical conditions, including lung and digestive disorders, heart disease, hypertension, and diabetes.^{5,7} Lung problems generally⁵ and asthma and allergies specifically^{5,7,10} rank in the top 15 most common medical conditions for which CAM is used for both children and adults. Unfortunately, there is a lack of recent literature summarizing the rates of CAM use among children and adults with asthma. Moreover, there is a critical need to compile and summarize the growing body of evidence on the most prevalent CAM modalities used, CAM effectiveness, and its possible side effects. This summary is crucial for allopathic and CAM practitioners treating patients with asthma, as well as individuals with asthma and their families who are engaged in decision making regarding asthma self-management practices.

The aim of this systematic review was twofold. First, we aimed to quantitatively summarize the existing body of research on CAM use for asthma among children and adults. Second,

we wanted to reflect on the most frequent CAM modalities used, the methodological quality and patterns presented in CAM studies, and the potential benefits and dangers of CAM use in asthma.

Methods

A systematic review of the literature¹² was conducted using the following databases: PubMed, PyscINFO, and SCOPUS. The following search terms were used: “asthma” AND “complementary medicine,” “alternative medicine,” “complementary and alternative medicine,” “herbs,” “diet,” “dietary supplements,” “vitamins,” “acupuncture,” “breathing (Buteyko) exercises,” “relaxation,” “mind-body,” “homeopathy,” “ayurveda,” “traditional Chinese medicine,” “colon cleansing,” “music,” “chiropractic,” “massage,” “art therapy,” “aromatherapy,” “yoga,” “tai-chi.” Search terms were determined after reviewing existing CAM literature, reviewing information from NCCAM and compiling associated keywords and subject headings. Table 1 summarizes the different CAM domains and examples.

The place of publication was limited to North America (Canada, Mexico, and the United States). Publications were also limited to English, Spanish, and French languages. We did not limit the age of publications. Manuscripts were included if they (1) presented primary or original research and (2) were focused on CAM use among children and adults with asthma. Manuscripts were excluded if they were duplicates from different databases or did not present original research on CAM use among individuals with asthma.

Data Collection and Analyses

The two authors (M.T. and M.G.) independently reviewed the abstracts and articles for inclusion with 100% interrater reliability. Data were extracted using a standardized template developed by the researchers to capture all relevant data. The template was reviewed by the authors and consensus reached through discussion between the authors.

Study Findings

Search Results

A total of 1960 abstracts were identified from the initial review, of which 904 were duplicates. After a detailed review, 984 additional articles were excluded because they did not meet the inclusion criteria: 322 articles did not directly focus on CAM use among individuals with asthma; 214 manuscripts did not present original research; and 448 of the studies were conducted outside of the United States, Canada, or Mexico. As a result, 72 articles were included in the review. See Fig. 1 for the detailed description of the search process and findings and Table 2 presenting qualitative summary of the reviewed articles.

In general, there is an increasing body of research on the use of different CAM modalities among individuals with asthma. As presented in Fig. 2, the number of articles on the topic remained low until the mid 1990s and then grew steadily, especially through the past decade.

Methodological Issues

Overall, the reviewed literature includes studies conducted using diverse designs and methodological techniques, ranging from randomized controlled trials (RCTs) to qualitative research using in-depth interviews. Specifically, 42% of the reviewed articles ($n = 30$, see Table 2 for details) reported results of surveys, using either descriptive or correlational designs. Most of these used secondary data from large-scale, comprehensively developed and thoroughly conducted national US surveys. For example, Joubert and colleagues¹³

analyzed data from the National Health Interview Survey (NHIS), the principal source of information on the health of the civilian noninstitutionalized US population. The NHIS is one of the major US data-collection programs.¹⁴ Using secondary NHIS data, the researchers were able to analyze 3327 responses of individuals with asthma across the United States to identify the association between asthma episodes in the past 12 months and CAM use, controlling for comorbid conditions. Several other investigators using similar survey designs were able to identify significant patterns of CAM use and its affects in the United States^{15–19} and in Canada.^{8,11}

Only one-third of the reviewed studies (n = 21) were RCTs despite RCTs being considered the “gold-standard” design when causal relationships between the treatments and health outcomes need to be established.²⁰ Further, there were several issues related to the quality of several of the RCT studies identified from this review. One example is an application of a technique that addresses the problems associated with incomplete data because of participant withdrawal, described as “intention-to-treat” analysis (ITT). In the ITT approach, all the participants are retained in study data analyses regardless of their path through the trial and completion of the study.^{21,22} Participants are retained in the treatment group they are randomized to (“as randomized”), rather than being classified according to the actual treatment they received (“as treated”). In general, ITT analysis produces an unbiased estimate of treatment effectiveness.²² One fundamental assumption of the ITT method is that missing data and participant withdrawal are not related to the unobserved outcome. ITT also assumes that compliance among those who remain in the trial and those who withdraw is equivalent. Sensitivity analysis and other statistical methods were developed to validate this assumption.²¹ In our review, 24% of the RCT studies used the ITT approach in their analysis^{23–27}; however, some of the researchers did not mention whether the assumptions about the missing data and adherence were validated and if sensitivity analysis was performed.^{23,24} This lack of information significantly limits the interpretation of the results of the reviewed RCTs.

Thirteen of the reviewed studies (18%) were conducted using quasi-experimental designs (mostly a 1-group pretest posttest design). This type of studies is important, especially when experimental methods are impractical or unethical to use; however, it is challenging to make definitive causal inferences using results of these studies. Several statistical methods were recently developed to enhance the causality conclusions of quasi-experimental studies, for example propensity scoring that reduces the confounding effects of covariates. Unfortunately, we did not identify that these methods were used in the reviewed manuscripts. In addition, it was noted that the number of quasi-experimental studies has decreased over time, with only 2 articles using this methodology published since 2005.

The balance of the reviewed studies (10%) used qualitative methods for the data analysis. Application of qualitative methods helps researchers to glean important personal information that is usually inaccessible otherwise. For example, Freidin and Timmermans²⁸ used open-ended questions to understand the experience with biomedical treatments, social influences, and concerns about adverse and long-term effects of prescription asthma medicines among mothers of children with asthma. In another study, George and colleagues²⁹ used in-depth interviews to identify causal models of asthma and the context of conventional prescription versus CAM use in low-income African American adults with asthma. More studies using qualitative methods are needed to further understand factors related to asthma medication adherence, possible adverse effects of CAM therapies, and other issues.

Patterns of CAM Use for Asthma

High CAM prevalence rates have been reported for both children and adults with asthma. Pediatric use has been reported to be as high as 80% when folk medicine (which includes prayer) is included in the broad definition of what constitutes a CAM practice.³⁰ Approximately one-quarter of children reported CAM use for asthma in the past year^{16,31} and use is highest in those children with poorer asthma control,^{11,32} financial barriers to conventional care,¹⁶ greater severity,¹⁶ more symptoms,^{30,33,34} or a CAM-using parent.^{7,30,31,35} As much as 80% of pediatric CAM care required an out-of-pocket expenditure.³⁶

Similarly, CAM use for adult asthma is extremely high (96%–100%) when survey questions include folk medicine/prayer.^{29,37} More than 70% report CAM for symptom management in the past month³³ and prevalence is higher in adults with work-related asthma,¹⁵ financial obstacles to accessing care,^{17,19} more symptoms,^{17,33} more stress,³⁸ and more frequent attacks.¹³

CAM Domains

Fig. 1 presents the reviewed articles by CAM domain. Almost half (47%) of the reviewed articles focused on multiple CAM modalities, with 30% concentrated solely on mind-body CAM approaches, 15% on natural products, and the remainder on manipulative and body-based practices (6%) or energy-field healing (2%).

Natural Products

As seen in Table 1, natural products encompass a wide variety of ingestible goods that include herbs, vitamins, minerals, specialized diets, dietary supplements, and botanicals. Unfortunately, much of what we know about their use is limited to prevalence surveys; few experimental studies have been conducted.

Unlike prescription drugs, manufacturers do not have to prove either the safety or the effectiveness of natural products. In fact, labels such as “safe,” “standardized,” “verified,” or “certified” do not guarantee quality or consistency.³⁹ For example, herbal therapies may contain more than one herb, the wrong species of herb, a higher or lower dose of active ingredient than listed on the label, or contaminants, such as other herbs, prescription medicine, pesticides, and heavy metals.⁴⁰ In addition, natural products are not inert and may interfere with prescription drugs to cause unintended side effects.⁴¹

Natural Products for Pediatric Asthma

Although vitamin supplementation is commonly used for pediatric asthma,^{16,31,35} a large longitudinal cohort survey study suggests that early vitamin supplementation may actually increase risk for asthma and food allergies in certain vulnerable populations.⁴² High use of herbal therapies is also reported,^{16,30,31,43,44} including over-the-counter (OTC) topical chest rubs made with camphor, eucalyptus oil and menthol,³⁰ herbal teas,³⁰ aloe plant juice,⁴⁴ *Echinacea*,⁴⁴ sweet oil (eg, olive, rapeseed, almond),⁴⁴ and an herbal cough syrup sold in *botanicas* containing sweet almond oil, castor oil, tolu (tree resin), wild cherry, licorice, cocillana (grape bark), and honey.³⁰ Atypical products reported include ephedra, turpentine, pine needles, and dried cow dung.⁴⁴

Children with asthma also use dietary supplements,³⁵ nutritional supplements, and elimination diets³¹ without scientific evaluation of their safety or effectiveness.⁴ In one study, Covar and colleagues²⁴ randomized children with asthma to either a nutritional formula composed of antioxidants, omega-3 and omega-6 fatty acids, or a control formula;

there were no differences in asthma-free days between groups, although inflammatory biomarkers decreased in the children receiving the nutritional formula.

Natural Products for Adult Asthma

Multivitamin use is associated with asthma in older adults⁴⁵ and herbal products are widely used (93%) by the general adult asthma population.^{29,46} Commonly used herbal therapies include chamomile, mint, and *Echinacea*.^{19,29,47–49} In addition, OTC ephedra products, as well as coffee and tea (which contain natural methylxanthines), are widely used to supplement, or replace, short-acting β -2 agonists (SABAs) for “rescue” treatment of acute asthma.^{29,48,49} Adults also report the use of home remedies to augment asthma self-management, such as Hall's lozenge-infused tea (Mondel z International Three Parkway North Deerfield, IL, USA), OTC chest rubs, and the ingestion of onion tonics, spicy foods (eg, horseradish), or cold drinks.²⁹ Importantly, a small number of individuals report oral ingestion of topical camphor products (eg, Vicks VapoRub [Proctor and Gamble, Cincinnati, Ohio, USA]).²⁹ Although few of these products have been scientifically evaluated, there are several studies of dietary supplements. These include studies of magnesium,⁵⁰ fish oil alone^{51,52} or in combination with Vitamin C, and a standardized hops extract.²³ Asthma quality-of-life scores improved in those who received long-term magnesium supplementation⁵⁰ and the combined nutritional supplement (fish oil, Vitamin C, and hops).²³ However, there was no attention control group in the combination supplement study, making it impossible to attribute improvements to the supplement.²³ Other markers of asthma control, such as reduced bronchial hyperreactivity, pulmonary function, and inflammatory biomarkers improved with magnesium and fish oils.^{50,51}

Potential Dangers of Natural Products for Pediatric and Adult Asthma

Several innocuous-appearing natural and OTC products have the potential for serious side effects, including death. For example, *Echinacea* (cone flower daisy) and chamomile are members of the Compositae or ragweed family. Worsening asthma may result if a ragweed-sensitive individual uses products derived from the daisy family, which includes honey made from the plants or pollens of Compositae.⁵³ In addition, OTC natural ephedra (found in *ma huang*, a Traditional Chinese Medicine herb), can have a synergistic cardiovascular effect when used with albuterol.⁵⁴ Black licorice made from the glycyrrhiza root can prolong the half-life of cortisone, potentiating systemic steroid effects.⁵⁵ Further, the recommended dose of Hall's is 1 to 2 lozenges every 2 hours, which delivers a total dose of 6 to 20 mg of menthol; some adults used large quantities of lozenges (10) in a single serving of tea,²⁹ which may be harmful.⁵⁶

Of greatest concern, however, were the reports of turpentine oil and Vicks VapoRub ingestion^{29,44} and risky behaviors associated with natural product use. First, ingesting turpentine oil⁵⁷ and OTC topical chest rubs can be fatal in children and may pose some risk for adults.⁵⁸ Second, even when natural product use is not in and of itself harmful, its use may contribute to risky health behaviors. For example, herbal product use is associated with decreased inhaled corticosteroid adherence.⁵⁹ Further, substituting caffeinated products (tea and coffee) for SABAs translates to the use of less potent natural therapies for more rapid-acting and effective prescription therapies during acute asthma episodes.³⁷ This may lead to less effective reversal of bronchospasm and contribute to delays in seeking appropriate medical intervention, placing the individual at increased risk for near-fatal or fatal asthma.⁴¹

Mind-body Medicine

Mind-body medicine encompasses a wide variety of practices that seek to use the mind to enhance physical functioning and health and are generally considered safe in healthy people when practiced.⁹⁰ Table 1 provides detailed information about many mind-body practices.

Mind-body Medicine for Pediatric Asthma

Breathing exercises (59%),¹⁶ prayer (70%–80%),^{33,60} and relaxation (85%) are the most popular mind-body approaches used by children with asthma.³³ Relaxation training may be taught as a stand-alone therapy^{61,62} or paired with biofeedback^{63,64} or guided imagery.^{65–67} Although early studies suggested that relaxation might improve lung function,⁶² these findings were not replicated in larger trials.⁶¹ However, in several small feasibility studies without a control condition, biofeedback-induced relaxation was associated with improvement in lung function,^{63,65,68} stress,⁶³ depression,⁶³ and anxiety,⁶⁵ whereas relaxation coupled with guided imagery improved lung function and anxiety.^{66,67} Although one small RCT of biofeedback and relaxation demonstrated improved pulmonary function, anxiety, and attitudes toward asthma, there was no difference between groups in asthma medication use, number of asthma attacks, or self-concept.⁶⁴

Hypnosis has also been examined in 2 pediatric asthma studies using a pre-post design. Reductions in symptoms⁶⁹ and severity scores without concomitant improvement in the number of asthma episodes or in pulmonary function tests were reported.⁷⁰ Further, a small RCT of an art therapy intervention (compared with a wait-list control) reported decreased anxiety and increased quality of life,⁷¹ whereas music therapy (singing) was associated with maintenance or improvement of lung function compared with relaxation.⁷²

Mind-body Medicine for Adult Asthma

Mind-body approaches are very popular among adults with asthma, including qi gong, tai chi,¹¹ prayer, humoral balance, and relaxation.^{29,37} Intervention studies of relaxation have demonstrated improvement in well-being and pulmonary function, as well as reduced symptoms⁷³ without a reduction in cortisol after training.⁷⁴ Subjects enrolled in biofeedback²⁷ or guided (mental) imagery⁷⁵ interventions required less asthma medicine^{27,75} and demonstrated improved lung function without concomitant improvement in the number of asthma flares²⁷ compared with a control group.

Other mind-body approaches studied included yoga, meditation, and music therapy. In a small controlled trial of yoga instruction that included postures (*yogasanas*), breathing exercises (*pranayamas*), and meditation, intervention subjects reported enhanced relaxation and less SABA use compared with control subjects, although objective measures of lung function remained unchanged.⁷⁶ Further, a randomized, controlled, double-masked clinical trial of Iyengar yoga failed to demonstrate any between-group differences in asthma quality of life, SABA use, spirometry, symptoms, or health care utilization for asthma.²⁶ In addition, small intervention studies of transcendental meditation,⁷⁷ music therapy, and progressive muscle relaxation²⁷ improved lung function, although the small increases in function were not considered to be of clinical significance.²⁷

Two studies used multiple CAM interventions. In the first RCT, yoga, journaling, and nutritional manipulation (elimination diet coupled with supplements of fish oil, Vitamin C, and a standardized hops extract) were given to the intervention group with subsequent improvements in their asthma quality of life scores. These results should be viewed cautiously, however, because of the lack of a control group and the confounding of multiple interventions.²³ In the second study, patients with asthma received training on multiple mind-body approaches, including deep-breathing relaxation, a cognitive-behavioral intervention, and journaling. When compared with an attention control group, the intervention group experienced improved lung function.⁷⁸

Single studies of Buteyko breathing and hypnotic susceptibility in adults have also been conducted. In an RCT of Buteyko, intervention subjects demonstrated improved asthma

control with less medication use up to 6 months after training compared with the control condition.⁷⁹ Moreover, a correlational study identified that higher hypnotic susceptibility scores were associated with less airway hyperreactivity.⁷⁹

Finally, several RCTs of acupuncture have been conducted in adults with asthma with mixed results. Treatment was associated with improved asthma quality of life²⁵ and reports of improved asthma⁸⁰ although acupuncture did not demonstrate improved lung function,^{80,81} reduced need for medications,^{25,81} or reduced symptoms.⁸¹

Potential Dangers of Mind-Body Medicine for Pediatric and Adult Asthma

NCCAM classifies most of the mind-body interventions as “safe”; however, there is small risk associated with some approaches. For example, progressive muscle relaxation has been associated with decreased airflow^{82–84} and increased heart rate variability^{82,83} in patients with asthma. In addition, there are case reports of untoward effects of mind-body therapies in the general population. For example, case reports describe complications related to yogic postures, including nerve or spinal damage,⁸⁵ worsened glaucoma,⁸⁶ and stroke.⁸⁷ There are also reports of yoga breathing causing pneumothorax.⁸⁸ Rare but serious complications may also result from acupuncture, including blood-borne illnesses, punctured organs, and vascular damage.⁸⁹ There are also reports of intensification of mania and distress after meditation⁹⁰ and hypnosis⁹¹ in patients with mental illness.

Manipulative and Body-based Practices

Spinal manipulation and massage are the 2 primary manipulative and body-based approaches. As described further in Table 1, practitioners manipulate joints and massage soft tissue to reduce pain and stress and to facilitate relaxation.

Manipulative and Body-based Practices for Pediatric Asthma

There are very few studies of manipulative and body-based practices despite a high rate of use by children with asthma.³⁵ A small RCT demonstrated that massage therapy reduced anxiety and cortisol levels immediately after treatment and improved attitudes toward asthma and lung function over time compared with the control condition (progressive muscle relaxation). These findings were more pronounced in younger children compared with older children.⁹² In a study by Bronfort and colleagues,⁹³ chiropractic spinal manipulative therapy improved asthma quality-of-life scores but failed to demonstrate any important changes in lung function or airway hyperreactivity compared with a sham chiropractic treatment. In an RCT of a spinal manipulation intervention, chiropractic care provided no additional benefit over usual medical care in children with mild to moderate asthma.⁹⁴

Manipulative and Body-based Practices for Adult Asthma

Only one study of manipulative therapy (craniosacral treatment) for adults with asthma was identified in this review.²⁵ In this investigation, 89 subjects were randomized to 1 of 5 groups: acupuncture alone, craniosacral therapy alone, acupuncture and craniosacral therapy together, attention control, or usual care/wait list. Asthma quality-of-life scores improved in all 3 of the active intervention groups, although the combination of acupuncture and craniosacral treatment was not superior to either therapy alone. Medication use and pulmonary function were unchanged.²⁵

Potential Dangers of Manipulative and Body-based Practices for Pediatric and Adult Asthma

When provided by a trained therapist, there are relatively few serious risks associated with massage or spinal manipulation for children or adults with asthma. Before massage therapy is initiated, a health care professional should provide medical clearance for individuals with concomitant conditions, such as pregnancy, propensity for bleeding (bleeding disorders, anticoagulant therapy), solid tumor cancers, blood clots, fractures, open wounds, skin infections, osteoporosis, or recent surgery.⁹⁵ Most serious side effects associated with spinal manipulation involve treatment of the cervical area and may include vertebrobasilar artery stroke and cauda equine syndrome.⁹⁶

Whole Medical Systems for Asthma

Whole medical systems are complete systems of theory and practice that have evolved over time in different cultures and apart from Western medicine.⁴ They include Traditional Chinese Medicine from China, Ayurveda from India, and homeopathy and naturopathy from Europe (see Table 1). Although these systems are widely used for asthma, no adult or pediatric studies were identified in this review.

Potential Dangers of Whole Medical Systems for Asthma

Mind-body medicine, manipulative approaches, and natural products are often essential components of whole medical systems approach to treating asthma. Therefore, the previous caution about their use is operative when patients seek such treatment; however, a particular point should be made about homeopathy. Because homeopathic treatments traditionally involve the ingestion of natural products, clinicians may be concerned about interactions or adverse side effects. Generally, plant material used in the preparation of homeopathic products is diluted to such infinitesimally small doses that not even one single active biologic molecule may remain in the “mother tincture,” thus rendering the product harmless.⁹⁷ However, nasal zinc is an exception to this rule. Reports of permanent loss of smell forced the Food and Drug Administration to recall this homeopathic cold remedy, which was not neither dilute nor orally ingested.⁹⁸

Energy Field Healing

As described in Table 1, magnets, Reiki, and therapeutic touch are the most commonly used energy-field healing practices. No adult or pediatric studies of energy healing were identified in this review.

Potential Dangers of Energy-Field Healing for Asthma

There is no known risk in the use of energy field healing practices such as Reiki or therapeutic touch.⁹⁹ Magnets are also safe when applied to the skin and are contraindicated only for individuals with medical devices affected by strong magnetic fields, such as pacemakers, implanted defibrillators, and insulin pumps.¹⁰⁰

Movement Therapies

Pilates, Rolfing, and Alexander are common movement therapies (see detailed in Table 1). No adult or pediatric studies examining movement practices were identified in this review.

Potential Dangers of Movement Therapies for Asthma

Although only one scholarly article on the safety of movement therapies was located (a single case report of a spontaneous diaphragm rupture attributable to Pilates),¹⁰¹ it is likely

that some of the same concerns about massage may be applicable to Rolting and that the Alexander technique might cause minor fatigue or muscle tenderness.

Traditional Healers

Mexican *Curandera*, Native American *shaman*, Puerto Rican *santeros*, and Voudoun *houngans* and *mambos* are among the many traditional healers that practice healing arts in North America (see Table 1). No adult or pediatric studies examining traditional healers were identified in this review.

Potential Dangers of Traditional Healers for Asthma

The use of natural products in traditional healing may cause drug-herb interactions, as previously described. In addition, some herbal preparations may be smoked as a treatment for asthma.¹⁰² Alternatively, individuals may visit a smokehouse where poor indoor air quality has been identified as a health risk for individuals with respiratory disorders, including asthma.¹⁰³ Other potential dangers of traditional healing have not been reported.

CAM and Asthma Self-management Decisions and Behavior: Self-management Preferences, Adherence, and Patient-Provider Communication

This review uncovered important information, not only about the types and patterns of CAM use, but also about the influence of CAM on asthma self-management decisions and behaviors in children and adults with asthma. For instance, a large qualitative study found that mothers considered their child's daily asthma therapy to be optional despite it being prescribed for daily use, were strongly influenced by their social network to use CAM for their child's asthma, and were not demographically distinguishable from mothers who used conventional prescription treatment.²⁸ Most (77%) caregivers considered herbal therapies to be safe and did not believe that herbs interacted with medication; only 1% could correctly name a drug-herb interaction.⁴⁴ Further, research demonstrated that adolescents were familiar with culturally relevant CAM¹⁰⁴ and believed CAM to be an effective part of their asthma armamentarium.^{30,60} Conversely, 71% of children and their caregivers voiced concerns about the safety of prescription therapies.⁴³ However, self-reported adherence to daily asthma therapies did not change with the initiation of CAM.¹⁰⁵

Despite the high rates of CAM use, only one-third of pediatricians asked about CAM.¹⁰⁶ Importantly, if asked, caregivers disclosed at relatively low rates ranging, from 36%³¹ to 54%.¹⁰⁷ Caregivers were more comfortable disclosing yoga and dietary interventions than prayer or guided imagery.³³ As a result of this reluctance to divulge CAM use, partial disclosure was more common (62%).³⁵ However, 80% of caregivers reported that they wanted to tell their provider about their child's CAM use.³¹

Most adults (84%) preferred an integrated approach for asthma self-management that included CAM and prescription therapies.³⁷ Nurses and CAM practitioners were more likely to ask about CAM use than allopathic physicians,¹⁰⁸ although there are no disclosure rates available specific to adults with asthma. CAM use was associated with low rates of adherence to daily prescription medicines^{37,59} and increased rates of hospitalization for life-threatening asthma.^{49,59} These high rates of acute health care utilization were independent of disease severity, suggesting that the use of less potent CAM for the home management of acute asthma may unnecessarily delay professional treatment and contribute to higher hospitalization rates.⁴⁹ This is supported by qualitative studies in which patients reported that CAM was safe and effective for the initial treatment of severe attacks,²⁹ was safer than SABAs, worked quickly and synergistically with SABAs,³⁷ and allowed for the customized treatment the patients desired.^{37,109}

Summary

There is a growing body of evidence on the use of CAM by individuals with asthma, particularly in the domains of natural products, mind-body medicine, and manipulative and body-based practices. Natural products were the most common CAM used by both children and adults with asthma. Unfortunately, much of what is known about the effectiveness of these treatments is based primarily on prevalence surveys and a few methodologically weak intervention studies that reported mixed results. Of note, several natural OTC products have the potential for serious side effects, including death. Use of natural products was also associated with risky asthma self-management behaviors, such as decreased adherence to allopathic treatments.⁵⁹ Mind-body medicines were also frequently used for asthma with one-third of the reviewed literature focused uniquely on this CAM approach. There were also several trials of spinal manipulation and massage, examples of manipulative and body-based practices. Again, weak study designs, mixed results, and the possibility of serious side effects are concerning. Most importantly, CAM use was rarely discussed in the clinical encounter.

Many clinicians assume that patients turn to CAM only when they have received a cancer diagnosis or develop cancer treatment-related symptoms.^{110,111} However, CAM is a popular treatment for asthma as well as a number of other chronic medical conditions, including diabetes,^{5,6,111,112} hypertension,^{5,6,113} and heart disease.^{5,6,114} The desire to use CAM as a way of personalizing treatment has also been noted by other researchers.^{115,116} Perhaps one of the most underappreciated risks of CAM is the failure of health care providers to inquire about CAM and patients' reluctance to disclose CAM use.¹¹⁷

There are several clinical implications of this review. First, it is important for clinicians and patients to discuss the risks associated with CAM use that include, but are not limited to, use of adulterated natural products, drug-herb interactions, and rare but serious events associated with innocuous-appearing therapies. Second, all CAM self-management strategies must be assessed for their timeliness and appropriateness, and negotiated through a shared decision-making model. For example, this review identified the risky behavior of substituting CAM for both "rescue" and daily asthma therapies. Perhaps a jointly developed plan that promotes the use of both CAM and prescription therapies at each of these events would be useful as a means of addressing patient preferences while also reducing the risk of an untoward event.

To be successful in this endeavor will require the provider to become better educated about CAM, to take the initiative in inquiring about CAM at each office visit, and to create a safe environment in which disclosure is facilitated. With this comes responsibility on the part of the health care professional to respond respectfully and professionally to disclosure. If the patient perceives that the provider is dismissive, derisive, or unsupportive, then a disruption to the therapeutic alliance can result.¹¹⁸ Health care professionals need help to successfully meet these expectations. The construction and validation of research instruments that address the integral role of CAM in asthma self-management decisions is a critical first step in the systematic collection of data about patient perceptions and preferences for care.¹¹⁹ Engaging in continuing education is also of paramount importance, as this training will facilitate a deeper appreciation for the reasons patients prefer CAM and will promote the acquisition of the enhanced communication skills needed to support integrative treatment as a cornerstone of patient-centered care.

In summary, this review provides clinicians with important new information: (1) CAM is widely used by both children and adults with asthma; (2) relatively little is known about the safety or effectiveness of CAM for asthma, owing to the paucity of well-designed studies; (3) patients use CAM to create a tailored asthma self-management plan; (4) CAM influences

patients' prescription medication-taking behaviors, which, in turn, produces other health risks; and (5) patients and health care professionals do not talk about, or participate in, shared decision making concerning CAM use. Most importantly, this review identifies knowledge gaps that can be addressed by future research. Taken together, this new knowledge may help narrow the divide between what patients want, and what providers currently offer, for asthma self-management.

Acknowledgments

Funding Sources: Mr Topaz: None; Dr George: This study was supported by the National Center for Complementary and Alternative Medicine (National Institutes of Health) 1K23AT003907-01A1. Conflict of Interest: None.

References

1. Kleinman A, Eisenberg L, Good B. Culture, illness, and care: clinical lessons from anthropologic and cross-cultural research. *Ann Intern Med.* 1978; 88(2):251–8. [PubMed: 626456]
2. Romanucci-Ross, L. The hierarchy of resort in curative practices: the Admiralty Islands, Melanesia. In: Landy, D., editor. *Culture, disease, and healing: studies in medical anthropology.* New York: Macmillan; 1977. p. 481–7.
3. World Health Organization. [Accessed July 22, 2012] WHO traditional medicine strategy 2002–2005. 2002. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=World%20Health%20Organization&date=2002&volume=2012&issue=07%2F22&atitle=WHO%20traditional%20medicine%20strategy%202002%E2%80%932005&au=World%20Health%20Organization%20&
4. National Center for Complementary and Alternative Medicine. [Accessed July 22, 2012] What is complementary and alternative medicine?. 2012. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2012&volume=2012&issue=07%2F22&atitle=What%20is%20complementary%20and%20alternative%20medicine%3F&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&
5. Esmail N. Complementary and alternative medicine in Canada: trends in use and public attitudes 1997–2006. *Public Policy Sources.* 2007; 87:1–53.
6. Nahin RL, Barnes PM, Stussman BJ, et al. Costs of complementary and alternative medicine (CAM) and frequency of visits to CAM practitioners: United States, 2007. *Natl Health Stat Report.* 2009; (18):1–14. [PubMed: 19771719]
7. Barnes PM, Bloom B, Nahin RL. Complementary and alternative medicine use among adults and children: United States. *Natl Health Stat Report.* 2007; 2008:1–23.
8. Metcalfe A, Williams J, McChesney J, et al. Use of complementary and alternative medicine by those with a chronic disease and the general population—results of a national population based survey. *BMC Complement Altern Med.* 2010; 10:58. [PubMed: 20955609]
9. Hannah, L. Master's thesis. Pacific University; 2010. Complementary and alternative medicine use among Mexican-Americans for general wellness and mental health.
10. Barnes PM, Powell-Griner E, McFann K, et al. Complementary and alternative medicine use among adults: United States. *Adv Data.* 2002; 2004(343):1–19. [PubMed: 12661975]
11. Torres-Llenza V, Bhogal S, Davis M, et al. Use of complementary and alternative medicine in children with asthma. *Can Respir J.* 2010; 17(4):183–7. [PubMed: 20808977]
12. Polit, D.; Beck, C. *Nursing research: generating and assessing evidence for nursing practice.* Philadelphia: Lippincott Williams & Wilkins; 2011.
13. Joubert A, Kidd-Taylor A, Christopher G, et al. Complementary and alternative medical practice: self-care preferred vs. practitioner-based care among patients with asthma. *J Natl Med Assoc.* 2010; 102(7):562–9. [PubMed: 20690319]

14. Centers for Disease Control and Prevention. [Accessed July 27, 2012] About the National Health Interview Survey. 2012. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=Centers%20for%20Disease%20Control%20and%20Prevention&date=2012&volume=2012&issue=27%2F07&atitle=About%20the%20National%20Health%20Interview%20Survey&au=Centers%20for%20Disease%20Control%20and%20Prevention%20&
15. Knoeller GE, Mazurek JM, Moorman JE. Complementary and alternative medicine use among adults with work-related and non-work-related asthma. *J Asthma*. 2012; 49(1):107–13. [PubMed: 22126603]
16. Shen J, Oraka E. Complementary and alternative medicine (CAM) use among children with current asthma. *Prev Med*. 2012; 54(1):27–31. [PubMed: 22015560]
17. Marino LA, Shen J. Characteristics of complementary and alternative medicine use among adults with current asthma, 2006. *J Asthma*. 2010; 47(5):521–5. [PubMed: 20536278]
18. Birdee GS, Wayne PM, Davis RB, et al. T'ai chi and qigong for health: patterns of use in the United States. *J Altern Complement Med*. 2009; 15(9):969–73. [PubMed: 19757974]
19. Loera JA, Black SA, Markides KS, et al. The use of herbal medicine by older Mexican Americans. *J Gerontol A Biol Sci Med Sci*. 2001; 56(11):M714–8. [PubMed: 11682580]
20. Bero L, Rennie D. The Cochrane Collaboration. Preparing, maintaining, and disseminating systematic reviews of the effects of health care. *JAMA*. 1995; 274(24):1935–8. [PubMed: 8568988]
21. Salim A, Mackinnon A, Griffiths K. Sensitivity analysis of intention-to-treat estimates when withdrawals are related to unobserved compliance status. *Stat Med*. 2008; 27(8):1164–79. [PubMed: 17724782]
22. Lachin JL. Statistical considerations in the intent-to-treat principle. *Control Clin Trials*. 2000; 21(5):526.
23. Kligler B, Homel P, Blank AE, et al. Randomized trial of the effect of an integrative medicine approach to the management of asthma in adults on disease-related quality of life and pulmonary function. *Altern Ther Health Med*. 2011; 17(1):10–5. [PubMed: 21614939]
24. Covar R, Gleason M, MacOmber B, et al. Impact of a novel nutritional formula on asthma control and biomarkers of allergic airway inflammation in children. *Clin Exp Allergy*. 2010; 40(8):1163–74. [PubMed: 20545703]
25. Mehl-Madrona L, Kligler B, Silverman S, et al. The impact of acupuncture and craniosacral therapy interventions on clinical outcomes in adults with asthma. *Explore (NY)*. 2007; 3(1):28–36. [PubMed: 17234566]
26. Sabina AB, Williams AL, Wall HK, et al. Yoga intervention for adults with mild-to-moderate asthma: a pilot study. *Ann Allergy Asthma Immunol*. 2005; 94(5):543–8. [PubMed: 15945557]
27. Lehrer PM, Vaschillo E, Vaschillo B, et al. Biofeedback treatment for asthma. *Chest*. 2004; 126(2):352–61. [PubMed: 15302717]
28. Freidin B, Timmermans S. Complementary and alternative medicine for children's asthma: satisfaction, care provider responsiveness, and networks of care. *Qual Health Res*. 2008; 18(1):43–55. [PubMed: 18174534]
29. George M, Birck K, Hufford DJ, et al. Beliefs about asthma and complementary and alternative medicine in low-income inner-city African-American adults. *J Gen Intern Med*. 2006; 21(12):1317–24. [PubMed: 16995890]
30. Reznik M, Ozuah PO, Franco K, et al. Use of complementary therapy by adolescents with asthma. *Arch Pediatr Adolesc Med*. 2002; 156(10):1042–4. [PubMed: 12361452]
31. Ottolini MC, Hamburger EK, Loprieto JO, et al. Complementary and alternative medicine use among children in the Washington, DC area. *Ambul Pediatr*. 2001; 1(2):122–5. [PubMed: 11888385]
32. Cabana MD, Gollapudi A, Jarlsberg LG, et al. Parent perception of their child's asthma control and concurrent complementary and alternative medicine use. *Pediatr Asthma Allergy Immunol*. 2008; 21(4):167–72.

33. Cotton S, Luberto CM, Yi MS, et al. Complementary and alternative medicine behaviors and beliefs in urban adolescents with asthma. *J Asthma*. 2011; 48(5):531–8. [PubMed: 21504264]
34. Sidora-Arcoleo K, Yoos HL, McMullen A, et al. Complementary and alternative medicine use in children with asthma: prevalence and sociodemographic profile of users. *J Asthma*. 2007; 44(3): 169–75. [PubMed: 17454333]
35. Post-White J, Fitzgerald M, Hageness S, et al. Complementary and alternative medicine use in children with cancer and general and specialty pediatrics. *J Pediatr Oncol Nurs*. 2009; 26(1):7–15. [PubMed: 18936292]
36. Ang JY, Ray-Mazumder S, Nachman SA, et al. Use of complementary and alternative medicine by parents of children with HIV infection and asthma and well children. *South Med J*. 2005; 98(9): 869–75. [PubMed: 16217978]
37. George M, Campbell J, Rand C. Self-management of acute asthma among low-income urban adults. *J Asthma*. 2009; 46(6):618–24. [PubMed: 19657906]
38. Baldwin CM, Long K, Kroesen K, et al. A profile of military veterans in the southwestern United States who use complementary and alternative medicine: implications for integrated care. *Arch Intern Med*. 2002; 162(15):1697–704. [PubMed: 12153372]
39. National Center for Complementary and Alternative Medicine. [Accessed July 25, 2012] Time to talk about dietary supplements: 5 things consumers need to know. 2012. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charSet=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2012&volume=2012&issue=07%2F25&atitle=Time%20to%20Talk%20About%20Dietary%20Supplements%3A5%20Things%20Consumers%20Need%20To%20Know&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&
40. National Center for Complementary and Alternative Medicine. [Accessed July 24, 2012] Using dietary supplements wisely. 2012. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charSet=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2012&volume=2012&issue=07%2F24&atitle=Using%20Dietary%20Supplements%20Wisely&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&
41. National Center for Complementary and Alternative Medicine. [Accessed July 25, 2012] Safe use of complementary health products and practices. 2012. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charSet=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2012&volume=2012&issue=07%2F25&atitle=Safe%20Use%20of%20Complementary%20Health%20Products%20and%20Practices&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&
42. Milner JD, Stein DM, McCarter R, et al. Early infant multivitamin supplementation is associated with increased risk for food allergy and asthma. *Pediatrics*. 2004; 114(1):27–32. [PubMed: 15231904]
43. Handelman L, Rich M, Bridgemohan CF, et al. Understanding pediatric innercity asthma: an explanatory model approach. *J Asthma*. 2004; 41(2):167–77. [PubMed: 15115169]
44. Lanski SL, Greenwald M, Perkins A, et al. Herbal therapy use in a pediatric emergency department population: expect the unexpected. *Pediatrics*. 2003; 111(5 Pt 1):981–5. [PubMed: 12728075]
45. Nahin RL, Fitzpatrick AL, Williamson JD, et al. Use of herbal medicine and other dietary supplements in community-dwelling older people: baseline data from the Ginkgo Evaluation of Memory study. *J Am Geriatr Soc*. 2006; 54(11):1725–35. [PubMed: 17087700]
46. Hailemaskel B, Dutta A, Wutoh A. Adverse reactions and interactions among herbal users. *Issues Interdiscipl Care*. 2001; 3(4):297–300.

47. Zayas LE, Wisniewski AM, Cadzow RB, et al. Knowledge and use of ethnomedical treatments for asthma among Puerto Ricans in an urban community. *Ann Fam Med*. 2011; 9(1):50–6. [PubMed: 21242561]
48. Blanc PD, Trupin L, Earnest G, et al. Alternative therapies among adults with a reported diagnosis of asthma or rhinosinusitis: data from a population-based survey. *Chest*. 2001; 120(5):1461–7. [PubMed: 11713120]
49. Blanc PD, Kuschner WG, Katz PP, et al. Use of herbal products, coffee or black tea, and over-the-counter medications as self-treatments among adults with asthma. *J Allergy Clin Immunol*. 1997; 100(6 Pt 1):789–91.
50. Kazaks AG, Uriu-Adams JY, Albertson TE, et al. Effect of oral magnesium supplementation on measures of airway resistance and subjective assessment of asthma control and quality of life in men and women with mild to moderate asthma: a randomized placebo controlled trial. *J Asthma*. 2010; 47(1):83–92. [PubMed: 20100026]
51. MacRedmond R, Singhera G, Attridge S, et al. Conjugated linoleic acid improves airway hyper-reactivity in overweight mild asthmatics. *Clin Exp Allergy*. 2010; 40(7):1071–8. [PubMed: 20642580]
52. Mickleborough TD, Lindley MR, Ionescu AA, et al. Protective effect of fish oil supplementation on exercise-induced bronchoconstriction in asthma. *Chest*. 2006; 129(1):39–49. [PubMed: 16424411]
53. National Center for Complementary and Alternative Medicine. [Accessed July 25, 2012] Chamomile. 2011. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2011&volume=2012&issue=07%2F25&atitle=Chamomile&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&
54. Newall, CA.; Anderson, LA.; Phillipson, JD. Herbal medicines: a guide for healthcare professionals. London: The Pharmaceutical Press; 1996.
55. National Center for Complementary and Alternative Medicine. [Accessed July 25, 2012] Licorice root. 2011. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2011&volume=2012&issue=07%2F25&atitle=Licorice%20Root&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&
56. Michael JB, Sztajnkrzyer MD. Deadly pediatric poisons: nine common agents that kill at low doses. *Emerg Med Clin North Am*. 2004; 22(4):1019–50. [PubMed: 15474780]
57. McKenzie LB, Ahir N, Stolz U, et al. Household cleaning product-related injuries treated in US emergency departments in 1990–2006. *Pediatrics*. 2010; 126(3):509–16. [PubMed: 20679298]
58. Nair B. Final report on the safety assessment of *Mentha piperita* (peppermint) oil, *Mentha piperita* (peppermint) leaf extract, *Mentha piperita* (peppermint) leaf, and *Mentha piperita* (peppermint) leaf water. *Int J Toxicol*. 2001; 20(Suppl 3):61–73. [PubMed: 11766133]
59. Roy A, Lurslurchachai L, Halm EA, et al. Use of herbal remedies and adherence to inhaled corticosteroids among inner-city asthmatic patients. *Ann Allergy Asthma Immunol*. 2010; 104(2): 132–8. [PubMed: 20306816]
60. Luberto CM, Yi MS, Tsevat J, et al. Complementary and alternative medicine use and psychosocial outcomes among urban adolescents with asthma. *J Asthma*. 2012; 49(4):409–15. [PubMed: 22715868]
61. Alexander AB, Cropp GJ, Chai H. Effects of relaxation training on pulmonary mechanics in children with asthma. *J Appl Behav Anal*. 1979; 12(1):27–35. [PubMed: 381275]
62. Alexander AB, Miklich DR, Hershkoff H. The immediate effects of systematic relaxation training on peak expiratory flow rates in asthmatic children. *Psychosom Med*. 1972; 34(5):388–94. [PubMed: 5076496]

63. Long KA, Ewing LJ, Cohen S, et al. Preliminary evidence for the feasibility of a stress management intervention for 7- to 12-year-olds with asthma. *J Asthma*. 2011; 48(2):162–70. [PubMed: 21332379]
64. Kotses H, Harver A, Segreto J, et al. Long-term effects of biofeedback-induced facial relaxation on measures of asthma severity in children. *Biofeedback Self Regul*. 1991; 16(1):1–21. [PubMed: 2012823]
65. Kapoor GV, Bray MA, Kehle TJ. School-based intervention: relaxation and guided imagery for students with asthma and anxiety disorder. *Can J Sch Psychol*. 2010; 25(4):311–27.
66. Dobson RL, Bray MA, Kehle TJ, et al. Relaxation and guided imagery as an intervention for children with asthma: a replication. *Psychol Schools*. 2005; 42(7):707–20.
67. Peck HL, Bray MA, Kehle TJ. Relaxation and guided imagery: a school-based intervention for children with asthma. *Psychol Schools*. 2003; 40(6):657–75.
68. Coen BL, Conran PB, McGrady A, et al. Effects of biofeedback-assisted relaxation on asthma severity and immune function. *Pediatr Asthma Allergy Immunol*. 1996; 10(2):71–8.
69. Anbar RD. Hypnosis in pediatrics: applications at a pediatric pulmonary center. *BMC Pediatr*. 2002; 2:11. [PubMed: 12460456]
70. Kohen DP, Wynne E. Applying hypnosis in a preschool family asthma education program: uses of storytelling, imagery, and relaxation. *Am J Clin Hypn*. 1997; 39(3):169–81. [PubMed: 9037794]
71. Beebe A, Gelfand EW, Bender B. A randomized trial to test the effectiveness of art therapy for children with asthma. *J Allergy Clin Immunol*. 2010; 126(2):263–6. 266.e1. [PubMed: 20462632]
72. Wade LM. A comparison of the effects of vocal exercises/singing versus music-assisted relaxation on peak expiratory flow rates of children with asthma. *Music Ther Perspect*. 2002; 20(1):31–7.
73. Smyth JM, Soefer MH, Hurewitz A, et al. The effect of tape-recorded relaxation training on well-being, symptoms, and peak expiratory flow rate in adult asthmatics: a pilot study. *Psychol Health*. 1999; 14(3):487–501.
74. Smyth J, Litcher L, Hurewitz A, et al. Relaxation training and cortisol secretion in adult asthmatics. *J Health Psychol*. 2001; 6(2):217–27. [PubMed: 22049323]
75. Epstein GN, Halper JP, Barrett EA, et al. A pilot study of mind-body changes in adults with asthma who practice mental imagery. *Altern Ther Health Med*. 2004; 10(4):66–71. [PubMed: 15285276]
76. Vedanthan PK, Kesavalu LN, Murthy KC, et al. Clinical study of yoga techniques in university students with asthma: a controlled study. *Allergy Asthma Proc*. 1998; 19(1):3–9. [PubMed: 9532318]
77. Wilson AF, Honsberger R, Chiu JT, et al. Transcendental meditation and asthma. *Respiration*. 1975; 32(1):74–80. [PubMed: 1118672]
78. Hockemeyer J, Smyth J. Evaluating the feasibility and efficacy of a self-administered manual-based stress management intervention for individuals with asthma: results from a controlled study. *Behav Med*. 2002; 27(4):161–72. [PubMed: 12165970]
79. Cowie RL, Conley DP, Underwood MF, et al. A randomized controlled trial of the Buteyko technique as an adjunct to conventional management of asthma. *Respir Med*. 2008; 102(5):726–32. [PubMed: 18249107]
80. Wechsler ME, Kelley JM, Boyd IO, et al. Active albuterol or placebo, sham acupuncture, or no intervention in asthma. *N Engl J Med*. 2011; 365(2):119–26. [PubMed: 21751905]
81. Tashkin DP, Kroening RJ, Bresler DE. A controlled trial of real and simulated acupuncture in the management of chronic asthma. *J Allergy Clin Immunol*. 1985; 76(6):855–64. [PubMed: 3905922]
82. Aboussafy D, Campbell TS, Lavoie K, et al. Airflow and autonomic responses to stress and relaxation in asthma: the impact of stressor type. *Int J Psychophysiol*. 2005; 57(3):195–201. [PubMed: 15975675]
83. Lehrer PM, Hochron SM, Mayne T, et al. Relationship between changes in EMG and respiratory sinus arrhythmia in a study of relaxation therapy for asthma. *Appl Psychophysiol Biofeedback*. 1997; 22(3):183–91. [PubMed: 9428968]
84. Lehrer PM, Hochron SM, Mayne T, et al. Relaxation and music therapies for asthma among patients prestabilized on asthma medication. *J Behav Med*. 1994; 17(1):1–24. [PubMed: 8201609]

85. Sinaki M. Yoga spinal flexion positions and vertebral compression fracture in osteopenia or osteoporosis of spine: case series. *Pain Pract.* 2012 Epub ahead of print.
86. Baskaran M, Raman K, Ramani KK, et al. Intraocular pressure changes and ocular biometry during Sirsasana (headstand posture) in yoga practitioners. *Ophthalmology.* 2006; 113(8):1327–32. [PubMed: 16806478]
87. Duval EL, Van Coster R, Verstraeten K. Acute traumatic stroke: a case of bow hunter's stroke in a child. *Eur J Emerg Med.* 1998; 5(2):259–63. [PubMed: 9846257]
88. Johnson DB, Tierney MJ, Sadighi PJ. Kapalabhati pranayama: breath of fire or cause of pneumothorax? A case report. *Chest.* 2004; 125(5):1951–2. [PubMed: 15136413]
89. National Center for Complementary and Alternative Medicine. [Accessed July 25, 2012] Acupuncture side effects, and risks. 2012. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2012&volume=2012&issue=07%2F25&atitle=Acupuncture%20Side%20Effects%20and%20Risks&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&
90. National Center for Complementary and Alternative Medicine. [Accessed July 25, 2012] Meditation: side effects and risks. 2012. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2012&volume=2012&issue=07%2F25&atitle=Meditation%3A%20Side%20Effects%20and%20Risks&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&
91. Klufft RP. Issues in the detection of those suffering adverse effects in hypnosis training workshops. *Am J Clin Hypn.* 2012; 54(3):213–32. [PubMed: 22443024]
92. Field T, Hentleff T, Hernandez-Reif M, et al. Children with asthma have improved pulmonary functions after massage therapy. *J Pediatr.* 1998; 132(5):854–8. [PubMed: 9602199]
93. Bronfort G, Evans RL, Kubic P, et al. Chronic pediatric asthma and chiropractic spinal manipulation: a prospective clinical series and randomized clinical pilot study. *J Manipulative Physiol Ther.* 2001; 24(6):369–77. [PubMed: 11514813]
94. Balon J, Aker PD, Crowther ER, et al. A comparison of active and simulated chiropractic manipulation as adjunctive treatment for childhood asthma. *N Engl J Med.* 1998; 339(15):1013–20. [PubMed: 9761802]
95. National Center for Complementary and Alternative Medicine. [Accessed July 25, 2012] Massage therapy: an introduction. 2012. Available at http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2012&volume=2012&issue=07%2F25&atitle=Massage%20Therapy%3A%20An%20Introduction&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&
96. National Center for Complementary and Alternative Medicine. [Accessed July 25, 2012] Chiropractic: an introduction. 2012. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2012&volume=2012&issue=07%2F25&atitle=Chiropractic%3A%20An%20Introduction&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&
97. National Center for Complementary and Alternative Medicine. [Accessed July 25, 2012] Homeopathy: an introduction. 2012. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2012&volume=2012&issue=07%2F25&atitle=Homeopathy%3A%20An%20Introduction&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&

%20for%20Complementary%20and%20Alternative
%20Medicine&date=2012&volume=2012&issue=07%2F25&atitle=Homeopathy%3A%20An
%20Introduction&au=National%20Center%20for%20Complementary%20and%20Alternative
%20Medicine%20&

98. National Center for Complementary and Alternative Medicine. [Accessed July 25, 2012] Time to talk about natural products for the flu and colds: what does the science say?. 2012. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2012&volume=2012&issue=07%2F25&atitle=Time%20To%20Talk%20About%20Natural%20Products%20for%20the%20Flu%20and%20Colds%3AWhat%20Does%20the%20Science%20Say%3F&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&
99. National Center for Complementary and Alternative Medicine. [Accessed July 25, 2012] Reiki: an introduction. 2012. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2012&volume=2012&issue=07%2F25&atitle=Reiki%3A%20An%20Introduction&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&
100. National Center for Complementary and Alternative Medicine. [Accessed July 25, 2012] Magnets for pain. 2012. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine&date=2012&volume=2012&issue=07%2F25&atitle=Magnets%20for%20Pain&au=National%20Center%20for%20Complementary%20and%20Alternative%20Medicine%20&
101. Yang YM, Yang HB, Park JS, et al. Spontaneous diaphragmatic rupture complicated with perforation of the stomach during Pilates. *Am J Emerg Med*. 2010; 28(2):259e1–3. [PubMed: 20159415]
102. University of Maryland Medical Center. [Accessed July 25, 2012] Lobelia. 2010. Available at: http://elinks.library.upenn.edu/sfx_local?sid=Refworks%3AUniversity%20of%20Pennsylvania&charset=utf-8&__char_set=utf8&genre=article&aulast=University%20of%20Maryland%20Medical%20Center&date=2010&volume=2012&issue=07%2F25&atitle=Lobelia&au=University%20of%20Maryland%20Medical%20Center%20&
103. Flanagan ME, Zaferatos NC. Appropriate technologies in the traditional Native American smokehouse: public health considerations in tribal community development. *Am Indian Cult Res J*. 2000; 24(4):69–93. [PubMed: 17111497]
104. Klein JD, Wilson KM, Sesselberg TS, et al. Adolescents' knowledge of and beliefs about herbs and dietary supplements: a qualitative study. *J Adolesc Health*. 2005; 37(5):409. [PubMed: 16227127]
105. Philp JC, Maselli J, Pachter LM, et al. Complementary and alternative medicine use and adherence with pediatric asthma treatment. *Pediatrics*. 2012; 129(5):e1148–54. [PubMed: 22492763]
106. Sawni A, Thomas R. Pediatricians' attitudes, experience and referral patterns regarding complementary/alternative medicine: a national survey. *BMC Complement Altern Med*. 2007; 7:18. [PubMed: 17547752]
107. Sidora-Arcoleo K, Yoos HL, Kitzman H, et al. Don't ask, don't tell: parental nondisclosure of complementary and alternative medicine and over-the-counter medication use in children's asthma management. *J Pediatr Health Care*. 2008; 22(4):221–9. [PubMed: 18590866]
108. Davis PA, Gold EB, Hackman RM, et al. The use of complementary/alternative medicine for the treatment of asthma in the United States. *J Investig Allergol Clin Immunol*. 1998; 8(2):73–7.

109. Mithani S, Monteleone C. Use of alternative therapies in patients with asthma in central New Jersey data from a pilot survey: data from a pilot survey. *Journal of Asthma and Allergy Educators*. 2011; 2(3):130–4.
110. Anderson JG, Taylor AG. Use of complementary therapies for cancer symptom management: results of the 2007 National Health Interview Survey. *J Altern Complement Med*. 2012; 18(3): 235–41. [PubMed: 22420737]
111. Vapiwala N, Mick R, Hampshire MK, et al. Patient initiation of complementary and alternative medical therapies (CAM) following cancer diagnosis. *Cancer J*. 2006; 12(6):467–74. [PubMed: 17207316]
112. Nahas R, Moher M. Complementary and alternative medicine for the treatment of type 2 diabetes. *Can Fam Physician*. 2009; 55(6):591–6. [PubMed: 19509199]
113. Nahas R. Complementary and alternative medicine approaches to blood pressure reduction: an evidence-based review. *Can Fam Physician*. 2008; 54(11):1529–33. [PubMed: 19005120]
114. Greenfield S, Pattison H, Jolly K. Use of complementary and alternative medicine and self-tests by coronary heart disease patients. *BMC Complement Altern Med*. 2008; 8:47. [PubMed: 18680571]
115. Edwards E. The role of complementary, alternative, and integrative medicine in personalized health care. *Neuropsychopharmacology*. 2012; 37(1):293–5. [PubMed: 22157860]
116. Astin JA. Why patients use alternative medicine: results of a national study. *JAMA*. 1998; 279(19):1548–53. [PubMed: 9605899]
117. Eisenberg DM, Kessler RC, Van Rompay MI, et al. Perceptions about complementary therapies relative to conventional therapies among adults who use both: results from a national survey. *Ann Intern Med*. 2001; 135(5):344–51. [PubMed: 11529698]
118. Tasaki K, Maskarinec G, Shumay DM, et al. Communication between physicians and cancer patients about complementary and alternative medicine: exploring patients' perspectives. *Psychooncology*. 2002; 11(3):212–20. [PubMed: 12112481]
119. Sidora-Arcoleo K, Feldman J, Serebrisky D, et al. Validation of the Asthma Illness Representation Scale (AIRS). *J Asthma*. 2010; 47(1):33–40. [PubMed: 20100018]
120. Murphy AI, Lehrer PM, Karlin R, et al. Hypnotic susceptibility and its relationship to outcome in the behavioral treatment of asthma: some preliminary data. *Psychol Rep*. 1989; 65(2):691–8. [PubMed: 2678205]

Key Points

- There is wide patient support for the use of complementary and alternative medicine (CAM) as part of a comprehensive asthma self-management plan for both children and adults.
- The most popular complementary and alternative treatments for asthma fall broadly into the domains of natural products, mind-body medicine, and manipulative and body-based practices.
- Little empiric evidence to support the use of CAM can be gleaned from this systematic review because of both the small number of studies and the methodological weaknesses of the studies.
- Most complementary approaches reported by children and adults with asthma would be classified by the National Center for Complementary and Alternative Medicine as “likely safe” and “effectiveness unknown” or “likely ineffective.”
- Rare but serious side effects have been reported with CAM for asthma self-management.
- Risky behaviors associated with CAM use for asthma include the substitution of complementary therapies for both “rescue” short-acting β -2 agonists and inhaled corticosteroids. These behaviors may add to unnecessary delays in seeking timely and appropriate medical intervention, thus contributing to excessive morbidity.
- There is suboptimal patient-provider communication about CAM use because of the failure of health care professionals to inquire about use and because of patients' reluctance to disclose use.
- To address patient preference for integrative care (concomitant use of CAM and prescription therapies) will require that clinicians conduct a more comprehensive assessment of use, be better informed about safety and risk of different therapies, and create a safe environment that fosters disclosure and shared decision making.

Fig. 1. Distinct phases in the process of collecting relevant publications on CAM use for asthma and their results.

Fig. 2.
Number of articles by year of publication.

Table 1
CAM domains and examples

NCCAM Domain Definitions	CAM Type	Examples	NCCAM Definition/Description
Whole Medical Systems are complete systems of theory and practice that have evolved over time in different cultures and apart from Western medicine	Ayurveda		Developed in India, it aims to integrate the body, mind, and spirit to prevent and treat disease using herbs, diet, massage, and yoga.
	Naturopathy		Developed in Europe, naturopathy seeks to stimulate self-healing through the use of dietary and lifestyle changes used in concert with massage, herbs and joint manipulation.
	Traditional Chinese Medicine (TCM)		Developed in China, TCM is based on the belief that disease is the result of an imbalance in yin and yang and disrupted flow of qi (life force). Balance and flow can be restored through the use of herbs, acupuncture, meditation, and massage.
	Homeopathy		Developed in Europe, homeopathy seeks to stimulate self-healing through doses of highly diluted substances that in larger doses would produce the symptoms of concern ("like cures like").
Natural Products are substances produced by living organisms and built by cells from sugars, amino acids, and so forth	Botanicals	Herbs and herbal products	Products that include any plant-based component.
	Minerals	Calcium, folate, iron, magnesium, selenium, zinc	
	Specialized diets	Gluten-free, allergen-free, ketogenic, low-residue	A special diet in which foods that produce unwanted symptoms are avoided.
	Dietary supplements	Minerals, vitamins, herbs, enzymes, proteins, organ tissues, or glands and metabolites	Any product taken by mouth with the intent of supplementing the diet.
	Vitamins	A, B12, B6, C, D, E, K	
	Herbs and herbal preparations	<i>Echinacea</i> , St Johns wort, chamomile, ginseng	Plants with leaves, seeds, flowers, bark, or roots used for medicinal purposes.
	Probiotics	Live microorganisms (bacteria; yeast)	
Mind-body Medicine	Meditation	Transcendental, Mindfulness	Meditation teaches an individual to focus attention, to become mindful of thoughts, feelings, and sensations and to observe them in a nonjudgmental way. Meditation is performed to achieve calmness, relaxation, and psychological balance.
	Tai chi		Developed in China as a martial art, tai chi is a "moving meditation" in which practitioners move their bodies slowly, gently, and with awareness, while breathing deeply.
	Guided imagery	Mental imagery, visualization	In guided imagery, the individual focuses on pleasant images or is led through storytelling or visualizations to replace negative or stressful feelings for the purpose of promoting relaxation.

NCCAM Domain Definitions	CAM Type	Examples	NCCAM Definition/Description
	Relaxation	Progressive muscle relaxation, passive muscle relaxation, relaxation breathing	In this practice, the individual focuses on tightening and relaxing each muscle group. It is often combined with guided imagery and breathing exercises.
	Hypnosis		Phrases or nonverbal cues (called a “suggestion”) produce relaxation to relieve pain and anxiety.
	Qi gong		Similar to tai chi.
	Yoga	Hatha, Iyengar, Ashtanga, Vinyasa, Bikram	Originating in ancient Indian philosophy, yoga combines physical postures, breathing techniques, and meditation or relaxation.
	Art therapy		Art-making as a therapeutic process.
	Cognitive behavioral therapy		Psychotherapeutic method to reduce stress and anxiety.
	Acupuncture		Part of traditional Chinese medicine (TCM), acupuncture aims to restore and maintain health through the stimulation of specific points on the body to encourage the flow of qi through channels called meridians.
	Biofeedback		Electronic devices are used to teach individuals to consciously reduce stress.
	Breathing retraining	Buteyko breathing exercises	Nasal breathing, reduced breathing, and relaxation are used to “normalize” breathing.
	Journaling		Writing therapy.
	Music therapy		Use of music to promote well-being or promote relaxation.
	Humoral balance		Ancient theory that disease results from an imbalance of 4 “humors.” Application of hot-cold therapies can be traced to this belief system.
	Deep breathing		Conscious slowing of breathing by focusing on taking regular and deep breaths to promote relaxation.
Manipulative and Body-based Practices focus primarily on the structures and systems of the body	Spinal manipulation	Chiropractic care Craniosacral therapy (cranial osteopathy)	The application of a controlled force to the joint by use of hands or a device with the intent of reducing pain and/or improving physical functioning.
	Massage	Swedish shiatsu Acupressure Trager Craniosacral therapy (cranial osteopathy)	Blood flow and oxygen are increased to the massaged area by pressing, rubbing, and moving soft tissues with the hands and fingers. The intent of massage is to reduce pain and stress and enhance relaxation, mood, and general well-being.
Movement Therapies include Eastern and Western movement-based practices to promote physical, mental, emotional, and spiritual well-being	Pilates		A physical fitness approach to core training that uses apparatuses to apply resistance as well as props, such as weighted balls.
	Rolfing		Deep fascial tissue manipulation and movement used to reduce stress by bringing the body into proper alignment with gravity.
	Alexander technique (AT)		This technique aims to teach individuals to stand and move free of

NCCAM Domain Definitions	CAM Type	Examples	NCCAM Definition/Description
			tension. AT is not an exercise or relaxation program.
Traditional Healers use indigenous and religious knowledge, beliefs, and experiences to treat disease and promote health	Shaman, Curandero, Santero, Houngan, Mambos		Healing power is passed down through generations via oral transmission and apprenticeships. Its use is generally reserved for members of a regional or cultural community.
Energy Field Healing involves the manipulation of the subtle energy fields imbued in humans	Magnet therapy	Energy-field manipulation	Magnets produce magnetic fields that are proposed to reduce pain.
	Reiki		Healing of the body and the spirit can be facilitated by the practitioner's transmitting universal energy to the person from a distance or from placing their hands on or near the individual.
	Light therapy		Exposure to green and blue wavelength light to promote sleep.
	Therapeutic touch		Manipulation of energy fields by placing hands on, or near, an individual.

Abbreviations: CAM, complementary and alternative medicine; NCCAM, National Center for Complementary and Alternative Medicine.

Table 2

Summary of included articles: CAM use in asthma

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Knoeller et al., ¹⁵ 2012	Survey, correlational	27,927 employed adults with current work-related asthma (WRA) as presented in the 2006–2008 Behavioral Risk Factor Surveillance System Asthma Call-Back Survey from 37 states and the District of Columbia.	An estimated 56.6% of individuals with WRA reported using CAM compared with 27.9% of those with non-WRA (PR = 2.0). People with WRA were more likely than those with non-WRA to have adverse asthma events including an asthma attack in the past month (PR = 1.43), urgent treatment for worsening asthma (PR = 1.74), emergency room visit (PR = 1.95), overnight hospital stay (PR = 2.49), and poorly controlled asthma (PR = 1.27). The associations of WRA with adverse asthma events remained after stratifying for CAM use.	Individuals with WRA were more likely to use CAM to control their asthma. However, there was no evidence that the use of CAM modified the association of WRA with adverse asthma events.	Adults; various CAM modalities
Luberto et al., ⁶⁰ 2012	Survey, correlational	282 adolescents (Time 1: n = 151, Time 2: n = 131) completed self-report measures	Participants (M(age) = 15.8, SD = 1.85) were primarily African American (n = 129 [85%]) and female (n = 91 [60%]) adolescents with asthma. High and low CAM users differed significantly in terms of several psychosocial health outcomes, both cross-sectionally and longitudinally. In cross-sectional multivariable analyses, greater frequency of praying was associated with better psychosocial health-related quality of life. No longitudinal relationships remained significant in multivariable analyses.	Specific CAM techniques are differentially associated with psychosocial outcomes, indicating the importance of examining CAM modalities individually. When controlling for key covariates, CAM use was not associated with psychosocial outcomes over time. Further research should examine the effects of CAM use in controlled research settings.	Adolescents; various CAM modalities
Philp et al., ¹⁰⁵ 2012	Survey, correlational (retrospective cohort study)	187 children prescribed daily medications for all 3 y of the study	Patients had high rates of adherence. The mean percent missed asthma daily controller medication doses per week was 7.7% (SD = 14.2%). Medication Adherence Scale scores (range: 4–20, with lower scores reflecting higher adherence) had an overall mean of 7.5 (SD = 2.9). In multivariate analyses, controlling for demographic factors and asthma severity, initiation of CAM use was not associated with subsequent adherence ($P > .05$).	The data from this study suggest that CAM use is not necessarily “competitive” with conventional asthma therapies; families may incorporate different health belief systems simultaneously in their asthma management. As CAM use becomes more prevalent, it is important for physicians to ask about CAM use in a nonjudgmental fashion.	Adolescent; Children; various CAM modalities
Shen and Oraka, ¹⁶ 2012	Survey, correlational	5435 children from the Asthma Call Back Survey (ACBS) 2006–2008, were included in this analysis.	Overall, 26.7% of children with current asthma reported CAM use in the previous 12 mo. Among them, the 3 most commonly used therapies were breathing techniques, vitamins, and herbal products. Multivariate analysis of	Children with poorly controlled asthma are more likely to use CAM; this likelihood persists after controlling for other factors (including parent’s education,	Children; various CAM modalities

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Cotton et al., ³³ 2011	Survey, correlational	151 adolescents with asthma recruited from a children's hospital completed questionnaires addressing demographic and clinical variables and 10 CAM modalities.	CAM use revealed higher adjusted odds ratios (aOR) among children who experienced cost barriers to conventional health care compared with children with no cost barrier (aOR=1.8). Children with poorly controlled asthma were most likely to use all types of CAM when compared with their counterparts with well-controlled asthma: aOR=2.3 for any CAM; aOR=1.7, for self-care based CAM; and aOR=4.4 for practitioner-based CAM.	barriers to conventional health care, and controller medication use). CAM is also more commonly used by children who experienced cost barriers to conventional asthma care. CAM use could be a marker to identify patients who need patient/family education and support and thus facilitate improved asthma control.	Adolescents; various CAM modalities
Kligler et al., ²³ 2011	Prospective parallel group repeated measurement randomized study	154 patients were randomized and included in the intention-to-treat analysis (77 control, 77 treatment).	Treatment participants showed greater improvement than controls at 6 mo for the Asthma Quality of Life Questionnaire total score ($P<.001$) and for 3 subscales, Activity ($P<.001$), Symptoms ($P=.02$), and Emotion ($P<.001$).	Many urban adolescents used and would consider using CAM, specifically relaxation and prayer, for asthma symptom management. African Americans, older adolescents, and those with more frequent symptoms were more likely to use and/or consider using CAM. Providers caring for urban adolescents with asthma should discuss CAM with patients, particularly those identified as likely to use CAM. Future studies should examine relationships between CAM use and health outcomes.	Adults; yoga (mind-body); dietary supplements (natural products); journaling (mind-body)
Long et al., ⁶³ 2011	Intervention trial (feasibility study with 2 intervention groups)	Cohort 1 ($n=11$) was recruited from the community and attended intervention sessions at an urban university. Cohort 2 ($n=7$) was	The intervention was rated as highly acceptable by participating families. Feasibility was much stronger for the school-based than the university-based recruitment mechanism. Initial efficacy data suggest that both cohorts showed	Findings provide evidence for the feasibility of offering asthma-related stress-management training in a school setting. Initial findings	Children; relaxation and biofeedback (mind-body)

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Mithani and Monteleone, ¹⁰⁹ 2011	Survey, descriptive (pilot)	school based and recruited from an African American charter school. 181 individuals with asthma filled out the survey	Over a period of 14 mo, 18% of the patients completing a survey reported using alternative therapies to treat asthma. The most common alternative therapy used was exercise/massage; the least popular was homeopathy. The highest users were women (59%), ages 41–50 (31%), white ethnicity (63%), higher education (56%), and higher annual household income (84%). The major reasons for usage were having more control of their health, personal beliefs, and concern over side effects of conventional medication.	The rate of alternative therapy use in patients with asthma in central New Jersey was lower than in some other studies. It is important for physicians to take CAM therapies into account to develop a health care plan consistent with patients' beliefs and expectations.	Adults; various CAM modalities
Wechsler et al, ⁸⁰ 2011	Randomized controlled trial (pilot)	46 patients with asthma were randomized to active treatment with an albuterol inhaler, a placebo inhaler, sham acupuncture, or no intervention.	Albuterol resulted in a 20% increase in FEV ₁ (1), as compared with approximately 7% with each of the other 3 interventions ($P < .001$). However, patients' reports of improvement after the intervention did not differ significantly for the albuterol inhaler (50% improvement), placebo inhaler (45%), or sham acupuncture (46%), but the subjective improvement with all 3 of these interventions was significantly greater than that with the no-intervention control (21%) ($P < .001$).	Although albuterol, but not the 2 placebo interventions, improved FEV ₁ in these patients with asthma, albuterol provided no incremental benefit with respect to the self-reported outcomes. Placebo effects can be clinically meaningful and can rival the effects of active medication in patients with asthma. However, from a clinical-management and research-design perspective, patient self-reports can be unreliable. An assessment of untreated responses in asthma may be essential in evaluating patient-reported outcomes.	Adults; acupuncture (mind-body)
Zayas et al, ⁴⁷ 2011	Qualitative, semistructured individual interviews	30 Puerto Rican adults who had asthma or were caregivers of children	Participants identified 75 ethnomedical treatments for asthma. Behavioral strategies that included conventional care (environmental remediation) and folk beliefs (chihuahuas in the home cure/control asthma) were significantly more likely to be used or perceived effective compared with ingested and topical remedies ($P < .001$). Among information sources for ingested and topical remedies, those recommended by community members were significantly less likely to be used or	Study sample of Puerto Rican subjects with a regular source of medical care was significantly more likely to use or perceive as effective behavioral strategies compared with ingested and topical remedies. Allopathic clinicians should ask Puerto Rican patients about their use of ethnomedical therapies for asthma to better understand their health beliefs and to integrate ethnomedical	Adults and caregivers of children with asthma; ethnomedical

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Beebe et al, ⁷¹ 2010	Randomized controlled trial	22 children with asthma were randomized to an active art therapy or wait-list control group.	Score changes from baseline to completion of art therapy indicated (1) improved problem-solving and affect drawing scores; (2) improved worry, communication, and total quality of life scores; and (3) improved Beck anxiety and self-concept scores in the active group relative to the control group. At 6 mo, the active group maintained some positive changes relative to the control group, including (1) drawing affect scores, (2) the worry and quality of life scores, and (3) the Beck anxiety score. Frequency of asthma exacerbations before and after the 6-mo study interval did not differ between the 2 groups.	This was the first randomized trial demonstrating that children with asthma receive benefit from art therapy that includes decreased anxiety and increased quality of life.	therapies with allopathic medicine. Children; art therapy
Covar et al, ²⁴ 2010	Randomized controlled trial	43 children with mild to moderate persistent asthma were randomized to receive daily novel nutritional formula (n = 23) or control formula (n = 20) for 12 wk.	Daily consumption of either NNF (a nutritional supplement composed of antioxidants, omega-3 and omega-6 fatty acids) or a control formula showed improvement in asthma-free days over time but there was no difference between groups. However, the NNF group had lower exhaled nitric oxide levels compared with the control group at weeks 4, 8, and 12 ($P < .05$). An overall group difference in log FEV(1) PC 20 ($P = .05$) was found in favor of the NNF group as well. Significantly higher levels of EPA in plasma ($P < .01$) and peripheral blood mononuclear cell (PBMC) ($P < .01$) phospholipids in the NNF group compared with the control group within 2 wk indicated good adherence with daily NNF intake. There were no differences in adverse events for NNF vs control groups after 12 wk.	Both NNF and control groups demonstrated improvement in asthma-free days. The NNF-treated group had reduced biomarkers of disease activity. Rapid PBMC fatty acid composition changes reflected an anti-inflammatory profile. Dietary supplementation with NNF was safe and well tolerated.	Children; dietary supplements (natural products)
Joubert et al, ¹³ 2010	Survey, correlational study	3327 responses of those ever having asthma as presented in National	Overall CAM use differed significantly by asthma status, with 49% of those with asthma episodes using CAM compared with 42% of those who did not have an episode in the past year. Self-care-based therapies were more likely to be used than practitioner-based therapies by individuals with a single	Although this study supports previous work indicating that disease severity (in this instance, asthma within the past year) is significantly associated with CAM use, it did not support studies showing greater CAM use in the presence of a greater number of comorbidities, suggesting that disease burden is a limiting factor	Adults; various CAM modalities

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Kapoor et al. ⁶⁵ 2010	Intervention-follow-up trial	3 participants	At the onset of the intervention, it was found that lung functioning, particularly FEV(1) increased in all 3 participants, with effect sizes ranging from -0.52 to -2.48. FEF25-75 improved in one of the participants. In addition, a positive impact was also seen in the lowering of anxiety scores across all 3 participants, with effect sizes ranging from 0.12 to 1.69.	School-based relaxation and guided imagery intervention improved anxiety and lung functioning.	Children; relaxation and guided imagery (mind-body)
Kazaks et al. ⁵⁰ 2010	Randomized controlled trial	55 males and females aged 21-55 y with mild to moderate asthma according to the 2002 National Heart, Lung, and Blood Institute (NHLBI) and Asthma Education and Prevention Program (NAEPP) guidelines and who used only beta-agonists or inhaled corticosteroids (ICS) as asthma medications.	The concentration of methacholine required to cause a 20% drop in FEV(1) increased significantly from baseline to month 6 within the Mg group. Peak expiratory flow rate (PEFR) showed a 5.8% predicted improvement over time ($P = .03$) in those consuming the Mg. There was significant improvement in overall AQLQ mean score units ($P < .01$) and in ($P = .05$) after 6.5 mo of supplementation. Despite these improvements, there were no significant changes in any of the markers of Mg status.	Adults who received oral Mg supplements showed improvement in objective measures of bronchial reactivity to methacholine and PEFR and in subjective measures of asthma control and quality of life.	Adults; Mg diet supplements (natural products)
MacRedmond et al. ⁵¹ 2010	Randomized controlled study	28 adult subjects with mild asthma were randomized to conjugated linoleic acid (CLA) 4.5 g/d or placebo for 12 wk in addition to usual treatment.	Subjects in the CLA (omega-6 fatty acid) group had a significant improvement in airway hyperresponsiveness at week 12 compared with week 0 (PC 20 6.6 [2.1] mg/mL vs 2.2 [0.7] mg/mL; $P < .05$). The CLA group had a significant reduction in weight and BMI compared with placebo and this was associated with a reduction in leptin/adiponectin ratio. There were no differences in systemic cytokine levels, induced sputum cell counts, quality-of-life scores, or adverse events.	Omega-6 fatty acid treatment as an adjunct to usual care in overweight mildly and moderately severe adults with asthma was well tolerated and was associated with improvements in airway hyperresponsiveness and BMI.	Adults; conjugated linoleic acid (natural products)
Marino and Shen, ¹⁷ 2010	Survey, correlational	7352 responses from the 2006 Behavioral Risk Factor Surveillance System (BRFSS) data from a subset of 25 states that completed the follow-up Asthma Callback Survey.	The prevalence of CAM use among adults with asthma was 39.6% (95% confidence interval [CI] = 36.9-42.3). There was no significant association with CAM use by sex, race/ethnicity, age, education, or geographic region. After adjusting for demographics and region, CAM use was significantly higher among persons with (1) financial barriers to asthma care (odds ratio [OR] = 2.8, 95% CI = 1.9-4.1); (2) an	CAM use is common among adults with asthma. It is associated with financial barriers to asthma care and poor asthma control. Physicians should discuss CAM use with their asthma patients.	Adults; various CAM modalities

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Metcalfe et al. ⁸ 2010	Survey, correlational study	400,055 Canadians aged 12 between 2001–2005 as presented in the Canadian Community Health Survey	emergency room (ER) visit due to asthma (OR = 1.7 95% CI = 1.1–2.6); and (3) 14 asthma-associated disability days during the previous year (OR = 2.1, 95% CI = 1.4–3.1). Weighted estimates show that 12.4% (95% CI: 12.2–12.5) of Canadians visited a CAM practitioner in the year they were surveyed; this rate was significantly higher for those with asthma 15.1% (95% CI: 14.5–15.7) and migraine 19.0% (95% CI: 18.4–19.6), and significantly lower for those with diabetes 8.0% (95% CI: 7.4–8.6), whereas the rate in those with epilepsy (10.3%, 95% CI: 8.4–12.2) was not significantly different from the general population.	A large proportion of Canadians use CAM services. Physicians should be aware that their patients may be accessing other services and should be prepared to ask and answer questions about the risks and benefits of CAM services in conjunction with standard medical care.	Adults; various CAM modalities
Sidora-Arcoleo et al. ¹¹⁹ 2010	Tool validation study	337 parents of children with asthma from Bronx and Rochester, NY.	Bronx parents were more likely to perceive their child's asthma to be moderate or severe than the Rochester parents. Bronx children were older and had longer duration of asthma and reported more acute health care visits (past year). Bronx parents reported total Asthma Illness Representation Scale scores more closely aligned with the lay model than Rochester parents. The Asthma Illness Representation Scale instrument demonstrated acceptable internal reliability among the Bronx sample (total score alpha = 0.82) and the Asthma Illness Representation Scale (AIRS) subscale Cronbach alpha coefficients were remarkably similar to those obtained from the original validation study (range = 0.54–0.83). Poor parents and those with less than a high school education had lower total AIRS scores than their counterparts. White parents had AIRS scores more closely aligned with the professional model compared with each of the ethnic subgroups. A perception of less severe asthma, fewer reports of asthma and somatization symptoms, and a positive HCP relationship were associated with IRs congruent with the professional model. IRs aligned with the professional model were associated with fewer acute asthma-related health care visits.	The AIRS instrument exhibited good internal reliability, external validity, and differentiated parents based on ethnicity, poverty, and education. Assessment of asthma IRs during the health care visit will allow the HCP and parent to discuss and negotiate a shared asthma management plan for the child, which will hopefully lead to improved medication adherence and asthma health outcomes.	Children; various CAM modalities

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Torres-Llenza et al, ¹¹ 2010	Survey, correlational	2027 children with asthma.	The median age of the 2027 children surveyed was 6.1 y (interquartile range 3.3–10.5 y); 58% were male and 59% of children had persistent asthma. The prevalence of CAM use was 13% (95% CI 12%–15%). Supplemental vitamins (24%), homeopathy (18%), and acupuncture (11%) were the most commonly reported CAMs. Multivariable logistic regression analysis confirmed the association of CAM use with age younger than 6 y (OR 1.86; 95% CI 1.20–2.96), Asian ethnicity (OR 1.89; 95% CI 1.01–3.52), episodic asthma (OR 1.88; 95% CI 1.08–3.28), and poor asthma control (OR 1.98; 95% CI 1.80–3.31).	The prevalence of reported CAM use among Quebec children with asthma remained modest (13%), with vitamins, homeopathy and acupuncture being the most popular modalities. CAM use was associated with preschool age, Asian ethnicity, episodic asthma, and poor asthma control.	Children; various CAM modalities
Roy et al, ⁵⁹ 2010	Survey, correlational	326 adults with persistent asthma who received care at 2 inner-city outpatient clinics.	Overall, 25.4% of patients reported herbal remedy use. Univariate analyses showed that herbal remedy use was associated with decreased ICS adherence and increased asthma morbidity. In multivariable analysis, herbal remedy use was associated with lower ICS adherence (OR, 0.4; 95% CI 0.2–0.8) after adjusting for confounders. Herbal remedy users were also more likely to worry about the adverse effects of ICS ($P = .01$).	The use of herbal remedies was associated with lower adherence to ICS and worse outcomes among inner-city asthmatic patients. Medication beliefs, such as worry about ICS adverse effects, may in part mediate this relationship. Physicians should routinely ask patients with asthma about CAM use, especially those whose asthma is poorly controlled.	Adults; herbs (natural products)
Birdee et al, ¹⁸ 2009	Survey, correlational	31,044 responses from the 2002 National Health Interview Survey (NHIS) Alternative Medicine Supplement.	We found that neither age nor sex was associated with T'ai chi and qigong use. T'ai chi and qigong users were more likely than nonusers to be Asian than white (OR 2.02, 95% CI 1.30–3.15), college educated (OR 2.44, 95% CI 1.97–3.03), and less likely to live in the Midwest (OR 0.64, 95% CI 0.42–0.96) or the southern United States (OR 0.51, 95% CI 0.36–0.72) than the West. T'ai chi and qigong use was associated independently with higher reports of musculoskeletal conditions (OR 1.43, 95% CI 1.11–1.83), severe sprains (OR 1.65, 95% CI 1.14–2.40), and asthma (OR 1.50, 95% CI 1.08–2.10).	In the United States, T'ai chi and qigong is practiced for health by a diverse population, and users report benefits for maintaining health.	Adults; T'ai chi (mind body); qigong (energy field)
George et al, ³⁷ 2009	Qualitative, semi-structured individual interviews	25 adults (92% female; 76% African American; mean age 39)	Only 1 subject had received asthma self-management training and only 10 (40%) used short-acting beta-(2) agonist-based (SABA) self-management protocols for the early treatment of acute asthma. No subject used a peak flow meter or an	All patients' acute asthma self-management strategies should be evaluated for their timeliness and appropriateness. This would be of particular importance	Adults; various CAM modalities

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Post-White et al., ³⁵ 2009	Survey, descriptive	281 respondents participated in the survey	asthma action plan. Most (52%) chose to initially treat acute asthma with CAM despite the availability of SABAs. Importantly, 21 (84%) preferred an integrated approach using both conventional and CAM treatments. Four themes associated with acute asthma self-management emerged from the qualitative analysis. The first theme, safety, reflected subjects' perception that CAM was safer than SABA. Severity addressed the calculation that subjects made in determining if SABA or CAM was indicated based on the degree of symptoms they were experiencing. The third theme, speed and strength of the combination, described subjects' belief in the superiority of integrating CAM and SABA for acute asthma self-management. The final theme, sense of identity, spoke to the ability of CAM to provide a customized self-management strategy that subjects desired.	for vulnerable populations who bear a disproportionate burden of the disease and who have the fewest resources.	Children; various CAM modalities
Cabana et al., ³² 2008	Survey, correlational	1322 parents of children with asthma	Eleven percent (141/1322) of children used CAM. Parents of children on daily medications who were perceived to have poor asthma control were almost 3 times more likely to use CAM than parents of children on no daily medications who were perceived to have high asthma control (risk ratio: = 2.81; CI: 1.72–4.60); age, gender, race, income, and education level were not significant independent predictors.	Parent perception of asthma control is significantly associated with CAM use. It is important for providers to elicit information regarding CAM use in the clinic, as this may imply that the asthma symptoms may not be well controlled.	Children; various CAM modalities
Cowie et al., ⁷⁹ 2008	Randomized controlled trial	129 individuals with asthma were randomized to 2 groups	Both groups showed substantial and similar improvement and a high proportion with asthma control 6 mo after completion of the intervention. In the Buteyko group the proportion with asthma control increased from 40% to	Six months after completion of the interventions, a large majority of subjects in each group displayed control of their asthma with the additional benefit of	Adults; Buteyko (mind-body)

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Freidin and Timmermans, ²⁸ 2008	Qualitative, open-ended individual interviews	50 mothers of children with asthma	The experience with biomedical treatments, social influence in mother's network of care, concerns about adverse and long-term effects of prescription asthma medicines, health care providers' responsiveness to such concerns, and familiarity with alternative treatments explain why some families rely on alternative medicine and others do not.	reduction in ICS use in the Buteyko group. The Buteyko technique or an intensive program delivered by a chest physiotherapist appear to provide additional benefit for adult patients with asthma who are being treated with ICS.	Children; various CAM modalities
Sidora-Arcoleo et al., ¹⁰⁷ 2008	Qualitative, structured individual interviews	228 parents of 5- to 12-year-old children with asthma	Seventy-one percent of parents reported using CAM and/or over-the-counter medication for children's asthma management, and 54% of those parents did not disclose usage. Seventy-five percent "did not think" to discuss it. Better parent-health care provider relationship led to increased disclosure.	Health care providers can play an important role in creating an environment where parents feel comfortable sharing information about their children's asthma management strategies in order to arrive at a shared asthma management plan for the child, leading to improved asthma health outcomes.	Children; various CAM modalities
Mehl-Madrone et al., ²⁵ 2007	Randomized controlled trial	89 individuals with asthma were randomly assignment to 1 of 5 groups: acupuncture, craniosacral therapy, acupuncture and craniosacral, attention control, and waiting list control	When treatment was compared with the control group, statistically treatment was significantly better than the control group in improving asthma quality of life, whereas reducing medication use with pulmonary function test results remained the same. However, the combination of acupuncture and craniosacral treatment was not superior to each therapy alone. In fact, although all active patients received 12 treatment sessions, those who received all treatments from one practitioner had statistically significant reductions in anxiety when compared with those receiving the same number of treatments from multiple practitioners. No effects on depression were found.	Acupuncture and/or craniosacral therapy are potentially useful adjuncts to the conventional care of adults with asthma, but the combination of the two does not provide additional benefit over each therapy alone.	Adults; acupuncture (mind-body); craniosacral therapy (manipulative and body-based practices)
Sawmi and Thomas, ¹⁰⁶ 2007	Survey, descriptive	648 pediatricians responded to the survey	More than 96% of pediatricians responding believed their patients were	Pediatricians have a positive attitude toward CAM. Most	Pediatricians; various CAM modalities

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Sidora-Arcoleo et al., ³⁴ 2007	Survey, correlational	228 parents and their 5 to 12-y-old children with asthma	<p>using CAM. Discussions of CAM use were initiated by the family (70%) and only 37% of pediatricians asked about CAM use as part of routine medical history. Most (84%) said more CME courses should be offered on CAM and 71% said they would consider referring patients to CAM practitioners. Medical conditions referred for CAM included chronic problems (headaches, pain management, asthma, backaches) (86%), diseases with no known cure (55.5%) or failure of conventional therapies (56%), behavioral problems (49%), and psychiatric disorders (47%). American-born, US medical school graduates, general pediatricians, and pediatricians who ask/talk about CAM were most likely to believe their patients used CAM ($P<.01$).</p> <p>65% of parents reported using CAM. Usage was highest among black, poor, less educated parents and children with persistent symptoms. Types of CAM differed by poverty and a trend for differences by race and education emerged.</p>	<p>believe that their patients are using CAM, that asking about CAM should be part of routine medical history, would consider referring to a CAM practitioner and want more education on CAM.</p>	Children; various CAM modalities
George et al., ²⁹ 2006	Qualitative, in-depth interviews	28 individuals who self-identified as being African Americans, low income, and an inner-city resident	<p>Sixty-four percent of participants held biologically correct causal models of asthma, although 100% reported the use of at least 1 CAM for asthma. Biologically based therapies, humoral balance, and prayer were the most popular CAM. Although most subjects trusted prescription asthma medicine, there was a preference for integration of CAM with conventional asthma treatment. CAM was considered natural, effective, and potentially curative. Sixty-three percent of participants reported nonadherence to conventional therapies in the 2 wk before the research interview. Neither CAM nor nonmedical causal models altered most individuals' (93%) willingness to use prescription medication. Three possibly dangerous CAM were identified.</p>	<p>Health care providers who educate themselves on CAM therapies that parents use for asthma can then discuss the implications of using these therapies and potentially improve adherence to the prescribed medication regimen.</p> <p>Clinicians should be aware of patient-generated causal models of asthma and use of CAM in this population. Discussing patients' desire for an integrated approach to asthma management and involving social networks are 2 strategies that may enhance patient provider partnerships and treatment fidelity.</p>	Adults; various CAM modalities
Mickleborough et al., ⁵² 2006	Randomized controlled trial	16 asthmatic patients with documented exercise-induced	<p>On the normal and placebo diet, subjects exhibited EIB; however, the fish oil diet improved pulmonary function to below the diagnostic exercise-induced</p>	<p>Data suggest that fish oil supplementation may represent a potentially beneficial nonpharmacologic</p>	Adults; fish oil (natural products)

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Nahin et al, ⁴⁵ 2006	Survey, descriptive	3072 ambulatory individuals aged 75 and older	In logistic regression models, multivitamin use was associated with female sex, a higher income, a higher modified Mini-Mental State Examination score, difficulty with mobility, and asthma history; use of any other vitamin or mineral was associated with female sex, white race, nonsmoking, more years of schooling, difficulty walking, a history of osteoporosis, and reading health and senior magazines.	There were substantial differences between individuals who used vitamins and minerals and those who used NVNMDs. These data require that trial investigators pay close attention to participant use of off-protocol dietary supplements. In addition, these findings may help identify elderly individuals likely to combine nonvitamin/nonmineral dietary supplement and prescription drugs.	Older adults; nonvitamin/nonmineral dietary supplement (natural products)
Aboussaty et al, ⁸² 2005	Intervention trial	31 adults with asthma participated in the study	The cold pressor test, asthma interview, and progressive muscle relaxation produced significant decreases in airflow compared with the baseline period. The cold pressor test and progressive muscle relaxation produced significant, complementary increases in vagal tone.	These results suggest that passive coping stressors and other stimuli (eg, certain forms of relaxation) that elicit increased vagal tone may be associated with poorer asthma control, a view consistent with a significant negative correlation between the participant's mean vagal tone response to the tasks and score on a measure of asthma self-efficacy.	Adults; progressive muscle relaxation (mind-body)
Ang et al, ³⁶ 2005	Survey, correlational	152 subjects were interviewed on the use of CAM for their children.	Compared with parents of the healthy and asthma groups, parents of the HIV group were less likely to be employed, were less likely to have private insurance, were less likely to have a high school or college education, and were more likely to be black. Interestingly, 38% of the healthy children parents used CAM in their children compared with 22% in the HIV group and 25% in the asthma group.	This study revealed a relatively high rate of CAM usage by parents of all three study groups. Although parents of children with HIV infection were more likely to want CAM as part of their children's medical care, their rate of CAM usage was not higher than that in well children. This may be related	Children; various CAM modalities

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Dobson et al, ⁶⁶ 2005	Intervention trial	4 children participants	More than 80% of all three groups paid out of pocket for their use of CAM in their children. Within these groups, HIV parents were more likely to want CAM as part of their child's medical care and were more likely to believe that CAM was expensive.	to their socioeconomic factors. A larger and more diverse study population may provide more information on factors contributing to CAM usage in chronically ill and well children.	Children; relaxation and guided imagery (mind-body)
Klein et al, ¹⁰⁴ 2005	Qualitative, focus groups	81 adolescents: suburban adolescents, urban minority adolescents, adolescents with chronic illness, (asthma, eating disorders, and diabetes), and patients of complementary/alternative practitioners in Monroe County, NY	Most adolescents are familiar with "herbal medicine," "herbal remedies," or "nutritional supplements," and are able to name specific products or CAM therapies; however, many are unfamiliar with the term "alternative medicine." Adolescents are more familiar with remedies or CAM therapies commonly used by people from their own cultural or ethnic background. Older suburban females and those with chronic illnesses are more familiar with herbs and supplements than other adolescents. Most supplement use is conceptually linked with treating illness rather than with preventive care.	Relaxation and guided imagery were found to be effective in improving the lung functioning of 3 of 4 participants in the study. Furthermore, overall happiness improved for 1 participant in the study, state anxiety decreased for 2 of the 4 participants, and trait anxiety decreased for all 4 participants.	Children; various CAM modalities (natural products)
Sabina et al, ²⁶ 2005	Randomized controlled trial (pilot)	62 participants with asthma	Intention-to-treat analysis was performed. Significant within-group differences in post bronchodilator FEV ₁ (l) and morning symptom scores were apparent in both groups at 4 and 16 wk; however, no significant differences between groups were observed on any outcome measures.	Most adolescents are familiar with culturally based herbal products and nutritional supplements, used for treatment of illnesses, and not for preventive care. Providers and researchers should consider chronic illness status and culture/family tradition, and clarify terms, when asking adolescents about self-care, over-the-counter, or CAM.	Adults; Yoga (mind-body)
Epstein et al, ⁷⁵ 2004	Randomized controlled trial (pilot)	68 adults with symptomatic asthma	There was little evidence of statistical change in this feasibility study; yet, valuable lessons were learned. Paired <i>t</i> tests indicated there was a significant difference in the total power scores in the imagery group, and in the expected direction and the choices subscale of the power instrument from weeks 1 to 16 of the study. Eight (47%) of 17 participants in the mental imagery group reduced or discontinued their medications. Three of 16 (19%) participants in the control	lyengar yoga conferred no appreciable benefit in mild-to-moderate asthma. Circumstances under which yoga is of benefit in asthma management, if any, remain to be determined.	Adults; mental imagery (mind-body)

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
			group reduced their medications; none discontinued. Chi-square indicated differences between groups. Persons who reduced or discontinued their medications showed neither an increase in pulmonary function before medication discontinuation, nor a fall in these parameters following discontinuation.	study also demonstrated that imagery is inexpensive, safe and, with training, can be used as an adjunct therapy by patients themselves. Its efficacy needs additional exploration. Further research for adults with asthma who practice imagery is important, as current treatments are not entirely efficacious. Lessons learned in this study may facilitate improvement in research designs.	
Handelman et al. ⁴³ 2004	Qualitative, explanatory models	19 children with 17 mothers from a variety of cultural backgrounds were interviewed	Among children, contagion was the primary explanatory model for asthma etiology (53%). Twenty-five percent of children reported fear of dying from asthma, whereas fear of their child dying from asthma was reported by 76% of mothers. Mothers reported a variety of explanatory models, some culturally specific, but most reported biomedical concepts of etiology, pathophysiology, and triggers. Although 76% of mothers knew the names of more than one of their children's medications, 47% thought their child's medications all had similar functions. Thirty-five percent of families used herbal treatments and 35% incorporated religion into asthma treatment. Seventy-one percent of families had discontinued medications and 23% reported currently not giving anti-inflammatory medication. Reasons for discontinuing daily medications included fears of unknown side effects (53%), addiction (18%), tachyphylaxis (18%), and feeling that their child was being given too much medicine (23%).	The traditional focus of asthma education is not sufficient to ensure adherence. Asthma education for children should address their views of etiology and fears about dying from asthma. Conversations with parents about their explanatory models and beliefs about medications and alternative therapies could assist in understanding and responding to parental concerns and choices about medications and help achieve better adherence.	Children; various CAM modalities
Lehrer et al. ²⁷ 2004	Randomized controlled trial	94 adult outpatient volunteers with asthma	Compared with the 2 control groups, subjects in both of the 2 heart rate variability biofeedback groups were prescribed less medication, with minimal differences between the 2 active treatments. Improvements averaged 1 full level of asthma severity. Measures from forced oscillation pneumography similarly showed improvement in pulmonary function. A placebo effect influenced an improvement in asthma symptoms, but not in pulmonary function. Groups did	The results suggest that heart rate variability biofeedback may prove to be a useful adjunct to asthma treatment and may help to reduce dependence on steroid medications. Further evaluation of this method is warranted.	Adults; biofeedback (mind-body)

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Milner et al. ⁴² 2004	Survey, correlational (longitudinal cohort survey study)	There were 8000 total patients in the study. The cohort data were taken from the National Center for Health Statistics 1988 National Maternal-Infant Health Survey, which followed pregnant women and their newborns, and the 1991 Longitudinal Follow-up of the same patients.	The overall incidence of asthma was 10.5% and of food allergy was 4.9%. In univariate analysis, male gender, smoker in the household, child care, prematurity (<37 wk), being black, no history of breastfeeding, lower income, and lower education were associated with higher risk for asthma. Child care, higher levels of education, income, and history of breastfeeding were associated with a higher risk for food allergies. In multivariate logistic analyses, a history of vitamin use within the first 6 mo of life was associated with a higher risk for asthma in black infants (OR: 1.27). Early vitamin use was also associated with a higher risk for food allergies in the exclusively formula-fed population (OR: 1.63). Vitamin use at 3 y of age was associated with increased risk for food allergies but not asthma in both breastfed (OR: 1.62; 95% CI: 1.19–2.21) and exclusively formula-fed infants (OR: 1.39; 95% CI: 1.03–1.88).	Early vitamin supplementation is associated with increased risk for asthma in black children and food allergies in exclusively formula-fed children. Additional study is warranted to examine which components most strongly contribute to this risk.	Children; Vitamins (natural products)
Lanski et al. ⁴⁴ 2003	Survey, descriptive	142 families participated in the study	Forty-five percent of caregivers reported giving their child an herbal product, and 88% of these caregivers had at least 1 y of college education. Of the children receiving these therapies, 53% had been given 1 type and 27% were given 3 or more in the past year. The most common therapies reportedly used were aloe plant/juice (44%), <i>Echinacea</i> (33%), and sweet oil (25%). The most dangerous potential herbal and prescription medication combination reported was ephedra and albuterol in an adolescent with asthma. The most unusual products reportedly used included turpentine, pine needles, and cowhips. Of all people interviewed, 77% did not believe or were uncertain if herbal products had any side effects and only 27% could name a potential side effect. Sixty-six percent were unsure or thought that herbal products did not interact with other medications and only 2 people correctly named a drug interaction. Of the people who used these therapies, 80% reported either friends or relatives as their primary	Herbal and home therapies are commonly used in this pediatric population. An unexpectedly wide variety of products were reportedly given to this patient population. Caregivers reported limited knowledge regarding potential adverse medication interactions and side effects. Limited discussions with the child's primary health care provider were reported. It is therefore important for health care providers to have knowledge about herbal medications, to inquire about their use, and to educate families about the risk/benefit as well as potential interactions these products may have with over-the-counter and prescription medications.	Children; Herbs (natural products)

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Peck et al. ⁶⁷ 2003	Intervention trial	4 children with asthma	With the introduction of the intervention, it was found that FEV(1) improved and anxiety decreased in all students. FEF25-75 improved in 3 of the 4 participants.	Relaxation and guided imagery improved asthma outcomes	Children; relaxation and guided imagery (mind-body)
Anbar. ⁶⁹ 2002	Intervention trial	303 patients with pulmonary symptoms attributable to psychological issues, discomfort due to medications, or fear of procedures	Hypnotherapy was associated with improvement in 80% of patients with persistent asthma, chest pain/pressure, habit cough, hyperventilation, shortness of breath, sighing, and vocal cord dysfunction. When improvement was reported, in some cases symptoms resolved immediately after hypnotherapy was first used. For the others, improvement was achieved after hypnosis was used for a few weeks. No patients' symptoms worsened and no new symptoms emerged following hypnotherapy.	Patients described in this report were unlikely to have achieved rapid improvement in their symptoms without the use of hypnotherapy. Therefore, hypnotherapy can be an important complementary therapy for patients in a pediatric practice.	Children; hypnosis (mind-body)
Baldwin et al. ³⁸ 2002	Survey, correlational	508 military veterans randomly selected from Southern Arizona Veterans Administration Health Care System (Tucson) primary care patient lists	Of the 508 subjects, 252 (49.6%) reported CAM use. Military veteran CAM users were significantly more likely to be non-Hispanic white, earn more than \$50 000 per year (both $P < .05$), and have more than 12 y of education ($P < .01$). Current high daily stress, perceived negative impact of military life on physical or mental health, and physician-diagnosed chronic illnesses (eg, gastrointestinal problems, insomnia, and asthma) were statistically associated with CAM use. Regression analysis provided adjusted odds ratios and indicated that ethnicity (non-Hispanic white), higher education, greater current daily stress, and overseas military experience were significant predictors of CAM use by these veterans (each $P < .05$).	Ethnicity, education, income, and several chronic health complaints are consistent with civilian CAM use. Findings also suggest, however, that physicians providing conventional medical care need to be aware of experiences unique to CAM-using military veterans.	Adults; various CAM modalities
Hockemeyer and Smyth, ⁷⁸ 2002	Randomized controlled trial (between-groups, prospective experimental design)	60 college students with asthma	The treatment group showed significant improvement in measures of lung function compared with the placebo group, but analysis revealed no differences in measures of perceived stress.	These findings provide initial support for the feasibility of self-administered manual-based interventions and some evidence that they can produce health benefits in individuals with asthma and,	Adults, relaxation, cognitive-behavioral treatment (mind-body)

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Reznik et al. ³⁰ 2002	Survey, correlational	200 children with asthma	Overall, 80% of participants reported using CAM for asthma. The most commonly reported CAM included rubs (74%), herbal teas (39%), prayer (37%), massage (36%), and Jarabe 7 syrup (24%). Subjects with daily or weekly symptoms were more likely to use CAM for each episode of asthma (72% vs 51%; $P = .005$). The 61% of subjects who had a family member who used CAM were more likely to use CAM again (84% vs 39%; $P < .001$). Of the respondents, 59% reported that CAM was effective.	Most adolescents with asthma in this study used CAM. The prevalence of CAM use in this study population was twice the national average for adults.	Children; various CAM modalities
Wade, ⁷² 2002	Intervention trial	9 children with asthma	Results indicate that the participants showed an increase or maintenance of lung functioning after singing, whereas results were not consistent following the relaxation condition.	Singing might have a positive effect on children with asthma.	Children; music therapy; relaxation (mind-body)
Blanc et al., ⁴⁸ 2001	Survey, correlational	300 adults with self-report of a physician diagnosis of asthma ($n = 125$) or rhinosinusitis without concomitant asthma ($n = 175$).	Any alternative practice was reported by 127 subjects (42%; 95% CI, 36%–48%). Of these, 33 subjects (26%; 95% CI, 21%–31%) were not current prescription medication users. Herbal use was reported by 72 subjects (24%), caffeine treatment by 54 subjects (18%), and other alternative treatments by 66 subjects (22%). Taking into account demographic variables, subjects with asthma were more likely than those with rhinitis alone to report caffeine self-treatment for their condition (OR, 2.5; 95% CI, 1.4%–4.8%), but herbal use and other alternative treatments did not differ significantly by condition group.	Alternative treatments are frequent among adults with asthma or rhinosinusitis and should be taken into account by health-care providers and public health and policy analysts.	Adult; various CAM modalities
Bronfort et al., ⁹³ 2001	Feasibility study of conducting a full-scale, randomized clinical trial	36 patients aged 6–17 y with mild and moderate persistent asthma were admitted to the study.	It is possible to blind the participants to the nature of the spinal manipulative therapy intervention, and a full-scale trial with the described design is feasible to conduct. At the end of the 12-wk intervention phase, objective lung function tests and patient-rated day and nighttime symptoms based on diary recordings showed little or no change. Of the patient-rated measures, a reduction of approximately 20% in beta(2) bronchodilator use was seen ($P = .10$). The quality-of-life scores improved by 10%–28% ($P < .01$), with the activity scale showing the most	After 3 mo of combining chiropractic spinal manipulative therapy with optimal medical management for pediatric asthma, the children rated their quality of life substantially higher and their asthma severity substantially lower. These improvements were maintained at the 1-y follow-up assessment. There were no important changes in lung function or hyperresponsiveness at any	Children; spinal manipulation (manipulative and body-based practices)

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Loera et al, ¹⁹ 2001	Survey, correlational	2734 responses from the Hispanic Established Populations for the Epidemiologic Study of the Elderly (Hispanic-EPESE) 1993–1994 were analyzed	<p>change. Asthma severity ratings showed a reduction of 39% ($P < .001$), and there was an overall improvement rating corresponding to 50%–75%. The pulmonologist-rated improvement was small. Similarly, the improvements in parent-rated or guardian-rated outcomes were mostly small and not statistically significant. The changes in patient-rated severity and the improvement rating remained unchanged at 12-mo posttreatment follow-up as assessed by a brief postal questionnaire.</p>	<p>time. The observed improvements are unlikely as a result of the specific effects of chiropractic spinal manipulative therapy alone, but other aspects of the clinical encounter that should not be dismissed readily. Further research is needed to assess which components of the chiropractic encounter are responsible for important improvements in patient-oriented outcomes so that they may be incorporated into the care of all patients with asthma.</p>	Adults; herbs (natural products)
Loera et al, ¹⁹ 2001	Survey, correlational	2734 responses from the Hispanic Established Populations for the Epidemiologic Study of the Elderly (Hispanic-EPESE) 1993–1994 were analyzed	<p>The use of herbal medicine in the 2 wk before the interview was reported by 9.8% of the sample. Chamomile and mint were the 2 most commonly used herbs. Users of herbal medicines were more likely to be women, born in Mexico, older than 75, living alone, and experiencing some financial strain. Having arthritis, urinary incontinence, asthma, and hip fracture were also associated with an elevated use of herbal medicines, whereas heart attacks were not. Herbal medicine use was substantially higher among individuals reporting any disability in activities of daily living, poor self-reported health, and depressive symptoms. Herbal medicine use was associated with the use of over-the-counter medications but not with prescription medications. Herbal medicine use was particularly high among respondents who had more than 24 physician visits during the year before the interview.</p>	<p>Herbal medication use is common among older Mexican Americans, particularly among those with chronic medical conditions, those who experience financial strain, and those who are very frequent users of formal health care services.</p>	Adults; herbs (natural products)
Ottolini et al, ³¹ 2001	Survey, cross-sectional	348 parents of children completed surveys.	<p>Forty percent (138) of parents were CAM users themselves, whereas 21% (72) had treated their child with CAM over the past year. Factors positively associated with child CAM use included parents' use of CAM ($P < .0001$); greater parent age ($P = .0005$); greater child age ($P = .001$); and complaints of frequent respiratory illnesses, asthma, headaches, and nosebleeds. Ethnicity and parental education were not associated with child CAM use. More than 50% of pediatric CAM users reported specific vitamin</p>	<p>Treatment of children with CAM is common and is frequently undertaken by parents without the knowledge or advice of their pediatrician.</p>	Children; various CAM modalities

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Snyth et al., ⁷⁴ 2001	Intervention trial	20 adults with asthma	supplementation, whereas 25% used other nutritional supplements or elimination diets, and more than 40% used herbal therapies. Thirty-two percent of CAM users had visited a CAM practitioner; 81% of pediatric CAM users would have liked to discuss it with their pediatrician, but only 36% did so.	This study suggests that relaxation training can influence cortisol secretion in individuals with asthma, but that these effects differ from those observed in healthy individuals and may be influenced by corticosteroid medication use.	Adults; breathing relaxation (mind-body)
Hailemaskel et al., ⁴⁶ 2001	Survey, descriptive	100 prospective adult customers visiting a health food store during a consecutive 5-day period completed a 20-item questionnaire	The 4 most common diseases reported were allergies, high blood pressure, depression, and asthma. The top 4 herbs used were St John's Wort, <i>Echinacea</i> , ginseng, and golden seal. Results identified 6 cases with potential herbal-drug interactions, 5 cases with potential herb-disease interactions, and 19% with potential adverse drug reactions.	The data from this survey suggest that although the use of herbs is widespread and commonly accepted, it is necessary to educate consumers about the potential risks involved in such unmonitored use.	Adults; herbs (natural products)
Snyth et al., ⁷³ 1999	Intervention trial (pilot)	22 community residents with asthma	Listening to a 20-min audiotaped relaxation training program led to decreased negative mood and stressor report, but was unrelated to positive mood. The report of asthma symptoms decreased over time following relaxation training, and peak expiratory flow rate was significantly increased by relaxation training.	This study provides evidence that a brief, inexpensive, tape-recorded relaxation intervention can improve well-being, decrease symptom report, and improve peak expiratory flow rate in asthma. The relatively inexpensive and low-risk nature of the treatment, as well as its benefit to quality of life, support its utility as a supplemental treatment.	Adults; breathing relaxation (mind-body)
Balon et al., ⁹⁴ 1998	Randomized controlled trial	91 children who had continuing symptoms of asthma despite usual medical therapy	Eighty children (38 in the active-treatment group and 42 in the simulated-treatment group) had outcome data that could be evaluated. There were small increases (7–12 L per minute) in peak expiratory flow in the morning and the evening in both treatment groups, with	In children with mild or moderate asthma, the addition of chiropractic spinal manipulation to usual medical care provided no benefit.	Children; spinal manipulation (manipulative and body-based practices)

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Davis et al, ¹⁰⁸ 1998	Survey, correlational	564 participants have completed the study surveys	<p>no significant differences between the groups in the degree of change from base line (morning peak expiratory flow, $P = .49$ at 2 months and $P = .82$ at 4 months). Symptoms of asthma and use of 3-agonists decreased and the quality of life increased in both groups, with no significant differences between the groups. There were no significant changes in spirometric measurements or airway responsiveness.</p> <p>The survey population was 46% male and 43% female; 11% did not specify gender. They ranged in age from younger than 31 y to older than 70. The largest group (37%) of respondents held degrees as medical doctors, 27% held doctorates in CAM-related disciplines, 11% had registered nursing degrees, 4% were acupuncturists, and 18% did not specify their training. Practice characteristics between MD and non-MD asthma care providers did not differ. Most had general practices (75%) seeing all ages of patients. MDs were less likely to use CAM techniques for asthma compared with non-MDs. Both groups identified dietary and nutritional approaches as their most prevalent and useful asthma treatment option. Use of botanicals, meditation, and homeopathy were frequently cited; statistically significant differences appeared in the rankings of treatment usefulness and prevalence between MDs and non-MDs. Non-MD asthma care providers were more likely to ask patients about their use of CAM treatments for asthma than MDs (92% vs 70%), whereas both groups showed statistically significant increases in their levels of patient inquiries compared with 2 y previously (up 9% and 8% for MDs and non-MDs respectively).</p>	<p>The predominance of diet and nutrition supplementation used by MDs and non-MDs suggests that further attention and research efforts should be directed toward this area of CAM practice. Other CAM practices, such as botanicals, meditation, and homeopathy appear to warrant research efforts. Differences between MDs and non-MDs in their use of such therapies may reflect different philosophies as well as training.</p>	Adults; various CAM modalities
Field et al, ⁹² 1998	Randomized controlled trial	32 children with asthma	<p>The younger children who received massage therapy showed an immediate decrease in behavioral anxiety and cortisol levels after massage. Also, their attitude toward asthma and their peak air flow and other pulmonary functions improved over the course of the study. The older children who received massage therapy reported lower anxiety</p>	<p>The reason for the smaller therapeutic benefit in the older children is unknown; however, it appears that daily massage improves airway caliber and control of asthma.</p>	Children; massage (manipulative and body-based practices); relaxation (mind body)

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Vedanthan et al. ⁷⁶ 1998	Randomized controlled trial	17 adults with asthma	after the massage. Their attitude toward asthma also improved over the study, but only one measure of pulmonary function (FEF 25%–75%) improved. Analysis of the data showed that the subjects in the yoga group reported a significant degree of relaxation, positive attitude, and better yoga exercise tolerance. There was also a tendency toward lesser usage of beta adrenergic inhalers. The pulmonary functions did not vary significantly between yoga and control groups.	Yoga techniques seem beneficial as an adjunct to the medical management of asthma.	Adults; yoga (mind-body)
Blanc et al. ⁴⁹ 1997	Survey, correlational	601 adults with asthma recruited from a random sample of pulmonary and allergy specialists.	Herbal asthma self-treatment was reported by 46 (8%); coffee or black tea self-treatment by 36 (6%); ephedrine or ephedrine OTC use by 36 (6%); and any of the 3 practices by 98 subjects (16%). Adjusting for demographic and illness covariates, herbal use (OR 2.5) and coffee or black tea use (OR 3.1) were associated with asthma hospitalization; OTC use was not (OR 0.8).	Even among adults with access to specialty care for asthma, self-treatment with nonprescription products was common and was associated with increased risk of reported hospitalization. This association does not appear to be accounted for by illness severity or other disease covariates. It may reflect delay in utilization of more efficacious treatments.	Adults; herbs (natural products)
Kohen and Wynne, ⁷⁰ 1997	Intervention trial	25 children with asthma and their parent(s)	Following participation in the Preschool Asthma Program, physician visits for asthma were reduced ($P = .0013$) and parents reported increased confidence in self-management skills. Symptom severity scores improved significantly after participation ($P < .001$). A possible association was noted between participation in the program and parental expectations or projections of future outcome ($.05 < P < .1$). No changes were observed in the frequency of asthma episodes or in pulmonary function tests before and after the program.	With the hypnotherapeutic approach of imagery, preschoolers developed new cooperation in asthma-care skills, including cooperative and consistent performance of peak flow measurements.	Children; hypnosis (mind-body)
Lehrer et al. ⁸³ 1997	Intervention trial	87 adults with asthma	Changes in forced expiratory volume/forced vital capacity were negatively correlated with those in cardiac interbeat interval. Contrary to the theory of a vagal-trigeminal reflex as mediator for relaxation-induced improvement in asthma, decreases in pulmonary function occurred during relaxation sessions, accompanied by increases in cardiovascular activity, and within-session changes in frontal EMG in the 1st	Results suggest that the immediate effects of generalized relaxation instruction can be associated with a parasympathetic rebound, which, in turn, may induce countertherapeutic changes in asthma.	Adults; progressive muscle relaxation (mind-body)

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Coen et al, ⁶⁸ 1996	Randomized controlled (pilot) study	20 participants, aged 12–22 y, with nonsteroid-dependent reactive airway disease participated.	session of training were positively associated with changes in forced expiratory volume/forced vital capacity. However, consistent with this hypothesis, first-session frontalis EMG changes were positively associated with changes in respiratory sinus arrhythmia, and last-session changes in cardiac interbeat interval were positively associated with changes in forced expiratory volume/forced vital capacity.	The findings suggest that biofeedback-assisted relaxation training has potential for improvement of asthma severity and immune function in young individuals with asthma.	Children; adults; biofeedback-assisted relaxation (mind-body)
Lehrer et al, ⁸⁴ 1994	Randomized controlled trial	106 medically prestabilized adults with asthma	Relaxation-group subjects reported feeling the most deeply relaxed and produced the greatest improvement in FEF during the last pre-session assessment period. All groups evidenced decreases in asthma symptoms. All groups showed decreases in pulmonary function immediately after relaxation sessions. None of the changes in pulmonary function reached levels that are accepted in drug trials to be of clinical significance, and the therapeutic changes occurred only in the situation where training was rendered.	Listening to music produced greater decreases in peaks of tension than progressive muscle relaxation, and it produced greater compliance with relaxation practice, but it did not produce any specific therapeutic effects on asthma.	Adults; music therapy; progressive muscle relaxation (mind-body)
Kotses et al, ⁶⁴ 1991	Randomized controlled trial	29 children with asthma	As compared with the facial stability subjects, the facial relaxation subjects exhibited higher pulmonary scores, more positive attitudes toward asthma, and lower chronic anxiety during the follow-up period. Subjects in the 2 groups, however, did not differ on self-rated asthma severity, medication usage, frequency of asthma attacks, or self-concept.	Based on the improvements we observed in pulmonary, attitude, and anxiety measures, we concluded that biofeedback training for facial relaxation contributes to the self-control of asthma and would be a valuable addition to asthma self-management programs.	Children; biofeedback-assisted relaxation (mind-body)
Murphy et al, ¹²⁰ 1989	Survey, correlational	12 adults with asthma	Hypnotic susceptibility measures appeared to be related to several measures of improvement in asthma	Findings indicate that hypnotic susceptibility and suggestive processes play	Adults; hypnosis (mind-body)

Authors, Primary	Design	Population	Results	Conclusions	Categories/Domain
Tashkin et al, ⁸¹ 1985	Randomized controlled	25 patients with moderate to severe asthma	Two-way analysis of variance failed to reveal a significant effect of either form of acupuncture on symptoms, medication use, or lung function measurements. Similarly, no significant acute effect of acupuncture on lung function, self-ratings of efficacy, or physician's physical findings was found by covariance analysis or the Wilcoxon signed-rank test. When data during the entire course of the study were examined on an individual basis by analysis of variance with repeated measures, only two subjects demonstrated significantly favorable responses to real vs placebo acupuncture, but one subject demonstrated the reverse, suggesting that these responses were not specifically related to acupuncture therapy.	The findings failed to demonstrate any short-term or long-term benefit of acupuncture therapy in the management of moderate to severe asthma.	Adults; acupuncture (mind-body)
Alexander et al, ⁶¹ 1979	Intervention trial	14 children with chronic and severe asthma	Heart rate, and to some extent, muscle tension results confirm the attainment of relaxed states. However, the lung function results fail to substantiate the previous, preliminary findings of a clinically meaningful change in pulmonary function following relaxation.	Relaxation did not have significant effect on lung function	Children; relaxation (mind-body)
Wilson et al, ⁷⁷ 1975	Intervention trial	21 adults with asthma	As compared with the initial values recorded before intervention, significant improvement in forced expiratory volume, peak expiratory flow rate, and airway resistance was noted.	The results indicated that transcendental meditation is a useful adjunct in treating asthma.	Adults; meditation (mind-body)
Alexander et al, ⁶² 1972	Randomized controlled trial	44 children with asthma	Results show that relaxation subjects manifested a significant mean increase in peak expiratory flow rate over sessions, compared with a nonsignificant mean peak expiratory flow decrease for controls.	Relaxation was effective to increase the peak expiratory flow rate.	Children; relaxation (mind-body)

Abbreviations: ACQ, Asthma Control Questionnaire; AQLQ, Asthma Quality of Life Questionnaire; BMI, body mass index; CAM, complementary and alternative medicine; EIB, Exercise induced bronchoconstriction; EMG, electromyogram; FEF, forced expiratory flow; FEV(1), forced expiratory volume in 1 second; HCP, health care provider; IL, interleukin; LTB, Leukotriene B4 and B5; OTC, over the counter; PC 20, provocative concentration of a substance (methacholine) causing a 20% fall in the Forced Expiratory Volume in 1 Second; PMNL, Polymorphonuclear Leukocyte; PR, Prevalence Ratio; TNF, tumor necrosis factor.