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The emergency department is an arena where all types of therapies must be acknowledged, as well as their possible effects on the patient's current condition and the potential for complications and interactions with other therapies.

The knowledge base for emergency medicine physicians continues to expand, and the ability to critically evaluate all prior therapy is important to assure good patient outcomes. The use of complimentary and alternative medicine (CAM) therapies has increased in popularity over time and is used by families for diverse reasons. (See Table 1.) The impact, both positive and potentially negative, cannot be denied.

For example, two cervical spine fractures have been referred into my department by conscientious chiropractors who requested radiographs prior to initiating therapy.

Also, parents whose children have unusual or chronic diseases may seek natural solutions to their children's problems. Unknowingly, they may complicate the disease by adding an herb, such as liquorice, which may produce toxicity in a child already on digoxin. The combination may not be immediately known because we fail to ask about other

therapies the family may be using in addition to prescribed medications. Families may perceive that "natural" therapies do not have potential side effects. As part of the screening history it is important to obtain information on all therapies the child may have received, including "home" remedies, not only to accurately manage medical problems but also to correctly prescribe therapies. It is important at the time of discharge to guide families to appropriate resources for identifying potential reactions with both over-the-counter medications and CAM therapies.

The authors of this issue present a comprehensive review of CAM therapies and a description of their uses and potential clinical implications in the treatment of children. Particular attention is paid to the scientific evidence supporting their use.

— The Editor

Introduction

The use of CAM therapies has become popular in the

United States and has gained some acceptance by the traditional health care establishment. Many medical schools, health insurers, and hospitals have begun incorporating CAM therapies into their practice. A recent survey of 125 medical

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schools asked about the incorporation of courses centered on CAM therapies into the more traditional medical school curriculum.¹ Of the 117 schools whose representatives replied, 64% reported offering elective courses in complementary or alternative medicine.¹ Common topics included chiropractic, acupuncture, homeopathy, herbal therapies, and mind-body techniques.

Definitions of what constitutes a CAM therapy vary widely depending on the source. CAM therapies most often are defined by what they are not: medical interventions neither taught widely by U.S. medical schools nor available in U.S. hospitals. But as CAM therapies become more widely accepted, such a definition may no longer be applicable.

Parents and caretakers claim that they most often use CAM therapies to treat their children because of advice given to them by family and friends. Other reasons include a fear of drug side effects, a chronic medical condition in which conventional medicine has little to offer, dissatisfaction with conventional

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medicines, and the belief that most practitioners of CAM therapies provide more personalized attention.

The use of CAM therapies is becoming a significant aspect of child health care. The use of CAM therapies by adults is increasing dramatically and their use to treat children is becoming more popular. As a result, it is important for all physicians who treat children to be familiar with CAM therapies, understand their uses, and be aware of the published scientific evidence.

Epidemiology

CAM therapies are used widely by adults in the United States. A 1997 national telephone survey reported that 42.1% of adults had used at least one form of CAM therapy during the previous year.² This rate had significantly increased from 1990, when 33.8% of adults reported using at least one form of CAM therapy.³ Based on results from this survey, it was estimated that, in 1997, 629 million Americans visited an alternative medicine practitioner, exceeding total visits to all U.S. primary care physicians. Adults most often chose to use a relaxation therapy or an herbal remedy. Adults who used CAM therapies were more likely to have an advanced level of education and a higher income than those who did not. Eighteen percent of adults reported using a prescription medication concurrently with either an herbal remedy or high-dose vitamins.

Many investigators have sought to determine how often CAM therapies are used to treat children. However, most of these studies have addressed the use of CAM therapies in regard to specific illnesses, such as asthma and cancer. Their use has been reported in 66% of children with cystic fibrosis, 70% of children with juvenile rheumatoid arthritis, 46% of children with cancer, and 55% of children with asthma.⁴⁻⁷

Few investigators have sought to determine how often CAM therapies are used in the general pediatric population. One researcher, using a self-administered survey in a pediatric outpatient department at an urban university general hospital in Montreal, Canada, reported that 11% of children had used at least one form of CAM therapy.⁸ The most common forms of therapies used were chiropractic, homeopathy, naturopathy, and acupuncture. Children who were treated with a CAM therapy tended to be older, have mothers who were more highly educated, and have parents who were more likely to use a CAM therapy. Parents reported that the most common reason they used a CAM therapy to treat their children was because of a word-of-mouth recommendation from a friend or family member.

A self-administered, cross-sectional survey of homeless youth reported that 70.1% of respondents had individually chosen to use a CAM therapy.⁹ Vitamins and herbs were most commonly used. The majority of homeless youth used a CAM therapy because they perceived it as more natural and organic.

One researcher surveyed 521 children who attended a pediatric clinic in southwest England. Again, using a self-administered questionnaire, 24% of children were reported to have been treated with a CAM therapy.¹⁰ Parents most often

Table 1. Why Parents Choose CAM Therapies

- Parents may choose CAM therapies for a variety of reasons:*
- Attracted to therapist recommended by family, friends, or the local community
 - Concerned about possible side effects of conventional therapies
 - Seeking relief for chronic ailments that defy short-term solutions
 - Fear conventional medicine and technology
 - Desire more personalized and holistic approach
 - Influenced by ethnic and cultural background
 - Believe alternative therapies are benign, effective, and natural
 - Seeking complementary treatment for a life-threatening illness
 - Want to participate actively in treatment
 - Alternative medicine readily available

Adapted from: Spigelblatt L. Alternative Medicine: A Pediatric Conundrum. In: Micozzi M, ed. *Physician's Guide to Alternative Medicine*. Atlanta: American Health Consultants; 1999:329.

used a CAM therapy to treat a problem related to the respiratory system and most often chose a homeopathic or naturopathic remedy.

One hundred seventy-nine children and their parents, living in a defined area in Alberta, Canada, were questioned about their use of CAM therapies.¹¹ Twenty-four percent of children ages 12-17 years and 13% of children ages 0-11 years had been treated with some form of CAM therapy. Children who were treated with a CAM therapy were more likely to have a parent or caretaker who also used a CAM therapy.

One group recently surveyed 860 pediatricians to assess their attitudes toward and practice of CAM therapies.¹² Eighty-four percent of pediatricians surveyed believed that some patients in their practice had used CAM therapies but one-half believed that fewer than 10% of their patients were actually using such therapies. Fifty percent of pediatricians surveyed reported that they would refer a patient for a CAM therapy. The most common therapies for which they would make a referral were biofeedback, self-help groups, relaxation, hypnosis, and acupuncture or acupressure. Pediatricians were less likely to recommend an herbal or homeopathic remedy.

Common Therapies for Children

The most common therapies used to treat children include chiropractic medicine, homeopathy, acupuncture and acupressure, massage, and naturopathy. Table 2 lists common pediatric disorders and the types of CAM therapies most often used to treat them.

Chiropractic Medicine

Chiropractic medicine is defined as the manipulation of a malaligned spine to promote the unimpeded flow of energy through the body and aid in its self-healing capacity. "Chiro-

Table 2. Common Pediatric Disorders and CAM Therapies Used in Treatment

DISORDER	TREATMENT
Asthma	Acupuncture Chiropractic Massage Acupressure <i>Ginkgo biloba</i>
Migraine/headache	Chiropractic Acupuncture and acupressure Feverfew Horseradish
Colic	Chiropractic Chamomile Slippery Elm bark
Otitis media	Chiropractic Belladonna Garlic Echinacea Acupuncture and acupressure

practic" is derived from a Greek word meaning "done by hand." Reports of its use have been found in early Greek and Chinese civilizations. It was first established as a discipline by an American grocer, Daniel David Palmer, in September 1895 when he restored a man's hearing by manipulating his spine.¹³ Chiropractors now comprise the third largest group of health professionals in the United States (following physicians and dentists), and have licensing boards in all 50 states.¹⁴ Since 1972, Medicare has reimbursed for chiropractic care for radiographically proven subluxation (malalignment) of the spine.² Other major health insurance companies cover these treatments as well.¹⁴ Chiropractic medicine has been reported as the most common form of CAM therapy used in children.⁸ Eighty percent of patients who go to chiropractic practitioners do so for musculoskeletal or neuroskeletal problems.¹³

The practice of chiropractic medicine is based on the body's ability to heal itself by the removal of malalignments of the spine (subluxations) through spinal manipulation (adjustment).¹⁴ The theory behind chiropractic healing is that misaligned spinal vertebrae impede the flow of energy, "the innate intelligence" of the human nervous system, and cause illness.¹³ Subluxations are believed to cause reflex irritation of somatic and autonomic nerves and result in neurogenic inflammation.¹⁴

There are two types of chiropractic practitioners.¹³ The "purists" or "straights" believe that subluxation is the leading cause of disease. The "mixers," comprising the majority of chiropractic practitioners today, are more open to conventional medicine. Mixers frequently give patients advice about exercise and nutrition and offer lifestyle counseling. However, spinal manipulation is the treatment most commonly used and identified with the practice of chiropractic medicine. Chiropractic treatment has been used for such common ailments as asthma and otitis media, as well as musculoskeletal complaints.

Limited studies pertaining to the use of chiropractic medicine have been performed in the pediatric population. One randomized, blinded study compared the efficacy of chiropractic treatment to passive soft-tissue manipulation as adjunctive treatment for childhood asthma.¹⁵ Eighty children between 7 and 16 years of age with a history of asthma for longer than a year that required the use of a bronchodilator at least three times a week were enrolled in this study. During an initial two-week period of evaluation, the children were evaluated by spirometry, methacholine challenge, and a pediatric asthma quality-of-life questionnaire. All patients had to have vertebral subluxation ascertained by palpation during the initial assessment. Children were then randomized to receive either active chiropractic manipulation (38 patients) or a combination of passive manipulation and massage (42 patients) for four months. No differences were reported between groups as measured by spirometry, airway responsiveness, symptoms, quality of life, or patient satisfaction.

There is some evidence that suggests spinal manipulation is an effective therapy for acute, uncomplicated, low back pain in adults.¹⁶ The Agency for Health Care Policy and Research evaluated published, randomized, controlled trials and meta-analyses of the use of chiropractic medicine in adults with low back pain.¹⁷ A 1994 statement by the agency recommended that "manipulation can be helpful for patients with acute low back problems when used within the first month of symptoms. A trial of manipulation for patients with symptoms longer than a month is probably safe, but its efficacy is unproven."¹⁷

Chiropractic medicine also has been evaluated for the treatment of neck pain and headache.¹³ Meta-analyses of trials that incorporated chiropractic medicine in the treatment of neck pain concluded that recommendations should be made with caution because of the small number of trials.^{18,19} However, there was some evidence that cervical manipulation in conjunction with other treatments might be effective for short-term neck pain relief.¹³ A systematic review of the treatment of headaches with chiropractic medicine concluded that manipulation might be beneficial for muscle tension headaches.¹⁹

Many clinicians and investigators have raised concerns about the safety of chiropractic medicine. There have been more than 138 reports of serious complications related to chiropractic manipulation.¹³ The potential for complication is much higher for cervical manipulation than for lumbar spine manipulation.¹³ The exact incidence of serious complications is unknown, but it is estimated to be 1 in 400,000 manipulations.¹³ Serious adverse events related to neck manipulation include vertebro-basilar accidents, such as brain stem or cerebellar infarction, Wallenberg syndrome, spinal cord compression, tracheal rupture, diaphragm paralysis, and internal carotid hematoma.¹³ The most serious complication of lumbar manipulation is cauda equina syndrome with an estimated occurrence of 1 per 100 million manipulations.¹³

Homeopathy

The practice of homeopathy is based on the idea of using a disease-causing substance in minimal doses to treat the

symptoms of that disease. The word "homeopathy" is derived from the Greek word "homois pathos" (similar suffering).²⁰ A German physician, Samuel Hahnemann, developed it as a system of medicine in the 19th century. Homeopathy was first introduced in the United States in 1825. The first national physician organization, The American Institute of Homeopathy, was founded in 1844.²¹ By the end of the 19th century, there were a total of 20 homeopathic medical colleges, 66 general homeopathic hospitals, and 74 specialty hospitals. However, the last homeopathic school closed in 1940. Currently, there are no schools that specialize in homeopathy, although 20 schools offer courses and continuing education in this area.²² As a result, there is a lack of uniform education and training standards in homeopathy. In a recent study, practitioners reported anywhere from 180 hours to 20 years of training.²²

There are several national boards that certify homeopathic practitioners: the Council on Homeopathic Certification; North American Society of Homeopaths; American Board of Homeo-therapeutics; and the Homeopathic Academy of Naturopathic Physicians.²²

Homeopathy, along with other forms of CAM therapies, has experienced a renaissance over the last 25 years. In 1997, there were an estimated 2 million visits to homeopathic practitioners.² Homeopathy is the second most common CAM therapy used in children, with respiratory and ear, nose, and throat problems being the two most common reasons for its use.⁸

The practice of homeopathy is based on two principles.^{22,23} The first is *similia similibus curentu* (like cures like). This principle implies that a poison ivy extract could be used to treat dermatitis, because it would cause similar symptoms in a healthy person. In actuality, many therapies do not have a specific relation to the inciting agent, even if it is identifiable.

The second principle is *doses minimae* (potentiation by dilution). Homeopathic remedies are prepared by serial dilution and vigorous shaking (succussion). This is believed to break down the initial active ingredient and transform it into an energetic imprint that triggers the body to heal itself.

In homeopathic remedies, the more diluted the remedy, the higher the potency.^{22,23} The potency of homeopathic remedies is reported in either the decimal (D) scale or the centesimal scale (C). That is, a 1:9 ratio is D1, and this dilution repeated eight times is D8. Similarly, a 1:99 ratio is a C1, and four repeated dilutions make it a C4. "Low" potency remedies are said to have a dilution of between D1 and D8, or C1 and C4. "Medium" potency remedies have a dilution of between D9 and D23, or C4 and C11, and "high" potency remedies have a dilution greater than D23 or C11.²⁴

There are four schools of thought within homeopathy.²⁵ The classical approach to homeopathy identifies a single medicine that corresponds with the patient's general constitution, which is derived from the patient's current illness, medical history, and personality. Complex homeopathy entails using a combination of medicines, mixed into a standard formula, to

cover a person's constitution. Clinical homeopathy utilizes single or multiple remedies to treat a conventional diagnosis or standard clinical situation. Isopathic homeopathy uses serial dilutions of a causative agent, which usually is infectious or toxic (as in vaccinations).

A meta-analysis of placebo-controlled trials that evaluated the use of homeopathic remedies recently was published.²⁵ Placebo-controlled trials of homeopathy, which were either randomized or double-blind to treatment or preventive studies, were included. Eighty-nine trials met inclusion and exclusion criteria, with a total of 10,523 patients treated (mean 118). Twenty-nine percent of the studies met pre-determined criteria for high quality. The studies were classified into the four main types of homeopathy (classical, 15%; clinical, 55%; complex, 22%; and isopathic, 8%) and three levels of potency (low, 37%; medium, 22%; and high, 37%). The overall odds ratio in favor of homeopathy was 2.45 (95% CI 2.05-2.93). After correcting for publication bias (underreporting of studies with negative or absence of statistical significance), the odds ratio was reduced to 1.78 (95% CI; 1.03-3.10, Z = 2.09). The results of this meta-analysis suggest that the clinical effects of homeopathy may not be due to a placebo effect. However, there are insufficient data to prove that any single type of homeopathic treatment is beneficial.

One group of researchers recently conducted a randomized, double-blind, placebo-controlled study of classical individualized homeopathic treatment of children with acute diarrhea.²⁶ Eighty-one Nicaraguan children, ages 6 months to 5 years, were followed for five days. All children received standard oral rehydration solution but also were randomized to receive either a placebo or a homeopathic remedy. A statistically significant reduction in the duration of diarrhea and number of stools after 72 hours of treatment was found in the group of children who received the homeopathic remedy. The group replicated its study in Nepal with 126 children and reported similar results.²⁷ Again, children in the treatment group had significantly fewer stools per day (3.2 vs 4.5, P = 0.023) and a quicker resolution of symptoms (P = 0.036).

A clinical benefit for homeopathic remedies has been shown for the treatment of mild traumatic brain injury, hayfever, allergic asthma, migraines, influenza, fibrositis, and rheumatoid arthritis.²⁸⁻³⁴ However, none of these studies have been repeated to prove the clinical effectiveness of the homeopathic remedies. There have been no studies proving the benefit of homeopathy for the treatment of otitis media.²⁵ Homeopathic alternatives to vaccines have not been evaluated in clinical trials and are not considered an effective substitute.²³

Homeopathic medications generally are considered very safe because of the dilution of the active ingredients to almost undetectable levels.²² Serious adverse reactions to homeopathic remedies are rarely reported.²³ Acute, transient worsening of symptoms (aggravation reactions) can occur and homeopaths interpret this as a good prognostic indicator of response.²³

There are two main concerns pertaining to the use of homeopathic remedies in children:

- **Recommendation against immunization.** In a recent survey, 9% of homeopaths in the Massachusetts area were

actively opposed to immunization of children.²² Similar surveys of homeopaths in Australia and England revealed most (83% and 70%, respectively) practitioners opposed immunizations.^{35,36}

- **Recognition of potentially serious, medically treatable conditions.** Some homeopaths believe that conventional drugs reduce the efficacy of homeopathic remedies.²³ In one survey, 50% of nonphysician homeopaths reported they would not immediately refer a febrile neonate to a physician or an emergency facility, and another 33% felt comfortable providing treatment.²²

Acupuncture and Acupressure

The medical practice of acupuncture and acupressure incorporates the practice of many different techniques. (See Table 3.) Acupuncture has been practiced in China for more than 2500 years.³⁷ Traditional Chinese medicine views illness as a result of an imbalance in a life energy (chi, qi, or ki). This energy exists as two opposite and complementary forces, the yin and the yang. Neither force is considered better or stronger than the other, and each individual has a unique combination of yin and yang. The 12 organ systems, and their energy pathways (meridians), are represented by 12 pulses that are palpated at six different locations on the radial artery at the wrist.³⁸ (Note: Organs and organ systems referred to in Chinese medicine do not always correlate with an anatomical organ or system.) The traditional Chinese physician's expertise lies in balancing the qi with diet, acupuncture, and herbal medicine. Acupuncturists who have pediatric expertise often use non-needle techniques such as moxibustion, magnets, massage, electric stimulation, shonishin, or a plum blossom hammer (a light hammer with thin, short needles used to tap acupoints).³⁹

The practice of acupuncture is based on the hypothesis that life energy, qi, flows through the body along meridians. Insertion of needles along these meridians removes blockages in the flow of energy. The significance of the 365 traditional acupuncture points is still unclear from a scientific standpoint. The available evidence suggests that stimulating acupuncture points changes the bioelectrical energy along motor nerves, triggering the release of specific neurotransmitters.³⁸ Some neurobiologic effects of acupuncture are reported to be caused by a release of endogenous opioids, serotonin, adrenocorticoid hormones, and glucocorticoids.³⁸ Naloxone, an opioid receptor antagonist, has been reported to counteract the effects of acupuncture in humans and in animal models.³⁸

An analgesic effect from acupuncture is thought to occur via a gate theory of pain conduction. Pain signals, transmitted by small diameter nerve fibers, are blocked by large nerve fibers in the same segment of the spinal cord, which have been stimulated by acupuncture.³⁸ Studies of electroacupuncture have shown that changing the frequency of electrical impulses through the same acupuncture needle resulted in the release of different neuropeptides in cerebrospinal fluid.³⁸

The National Institutes of Health (NIH) consensus conference on acupuncture, the findings of which were published

in 1998, recognized the efficacy of acupuncture for the treatment of adult postoperative and chemotherapy-induced nausea and vomiting as well as postoperative dental pain.⁴⁰ Other conditions were identified for which acupuncture may be useful as an adjunct treatment or an acceptable alternative, or be included in a comprehensive management program. These included stroke rehabilitation, addiction, headache, menstrual cramps, tennis elbow, fibromyalgia, myofascial pain, osteoarthritis, carpal tunnel syndrome, and asthma.⁴⁰

One of the inherent problems in study designs that evaluate the use of acupuncture has been the use of appropriate control groups, such as placebo or sham acupuncture groups. The placebo groups typically receive random placement of needles at non-acupoints. However, there is believed to be some neuropeptide response to the placement of acupuncture needles even at nonacupoints. Further, practitioners often use a combination of different points, based on the constitution of each individual, making it difficult to standardize acupoints.

A group of researchers have recently developed a sham acupuncture needle that does not penetrate the skin.⁴¹ In a crossover experiment involving 60 volunteers, sham needles were compared to true needles. No significant difference was found in the perception of penetration of the two needles.⁴¹

Several studies involving adults have shown that acupuncture is effective for the treatment of patients with post-operative nausea and vomiting (PONV) following gynecological surgery, with stroke, for prophylaxis of recurrent urinary tract infections, with addictions other than nicotine, and with migraine.⁴²⁻⁴⁶ Acupuncture has not been shown to be effective for the treatment of severe tinnitus or for the treatment of motion sickness.^{47,48}

A meta-analysis of 19 studies using non-pharmacologic techniques (acupuncture, electroacupuncture, transcutaneous electrical nerve stimulation, acupoint stimulation, and acupressure) to prevent PONV showed that these techniques were equivalent to antiemetic drugs.⁴⁹ Nonpharmacologic techniques were more effective than placebo for preventing PONV in adults, but not in children.⁴⁹

There are few studies evaluating the use of acupuncture/acupressure in children. A study conducted at the Children's Hospital, Boston, evaluated the antiemetic properties of acupressure-acupuncture in children 2-12 years of age undergoing tonsillectomy.⁵⁰ One hundred patients were enrolled and randomly assigned to receive either two Acubands (study), or two bands without spherical beads (placebo), which were applied bilaterally on the P6 wrist acupoints before anesthetic induction. After induction, the beads were changed to acupuncture needles. All points were covered with tape and left until the following day. Emesis was treated with antiemetic agents. The investigators reported that acupuncture and acupressure did not reduce postoperative emesis in children following tonsillectomy (51% in study vs 55% in placebo group).

In a more recent study, Korean hand acupressure was found to reduce postoperative vomiting in children following strabismus surgery.⁵¹ Fifty children between 3 and 12

Table 3. Types of Acupuncture and Acupressure³⁷

ACUPUNCTURE	The use of fine needles at specific points on the body to balance or correct the imbalance of circulation of energy flow (qi).
MOXIBUSTION	The burning of an herb or needle at an acupuncture point.
ELECTROACUPUNCTURE	The use of electric stimulation at acupuncture points.
FRENCH ENERGETIC ACUPUNCTURE	The use of needles as electrodes to release blockage of electrolytes.
FIVE-ELEMENT ACUPUNCTURE	The use of wood, fire, metal, water, and earth as five basic qualities to describe personality and organ dysfunction and aid in the choice of acupuncture points.
AURICULAR ACUPUNCTURE	A French tradition of using ear acupoints.
MYOFASCIAL ACUPUNCTURE	The palpation for tender points along meridians (energy pathways), which signify a blockage of energy flow.
ACUPRESSURE	The use of deep fingertip pressure massage along meridians.
KOREAN HAND ACUPRESSURE/ACUPUNCTURE	The use of needles or pressure on pressure points of the hands and feet.
SHONI SHIN	A Japanese system of acupuncture that uses small tools such as tapping needles, press needles, and round edged rakes instead of more traditional acupuncture needles.

years of age were randomly assigned to receive Korean hand acupressure at the K-K9 point using either a disc (AB-Bong) or no disc. The area was subsequently covered by tape. The disc was left in place for at least 24 hours post surgery. The incidence of vomiting was significantly lower ($P < 0.001$) in the acupressure group (20%) than in the placebo group (68%).

Transmission of hepatitis, human immunodeficiency virus (HIV), and subacute bacterial endocarditis are the three most serious complications reported following acupoint treatment.³⁷ There have been reports of septicemia, pneumothorax, cardiac tamponade, and spinal cord injury following acupuncture.⁵² Risks of infection increase when acupuncture needles are improperly used or handled.

Massage

Massage therapy is defined as the use of massage or touch to increase circulation and metabolism, improve muscle tone, control pain, and remove toxins from the body. There

Table 4. Herbal Remedies and Their Common Uses

HERB	USE
Feverfew	Migraine headache prophylaxis
Echinacea	Immune stimulation
<i>Ginkgo biloba</i>	Cerebral insufficiency
St. John's wort	Depression
Aloe vera	Canker sores, gastric ulcers, burns
Chamomile	Colic

are two basic massage styles, Swedish massage and Shiatsu, practiced in the United States. Therapeutic touch is derived from Swedish massage. Shiatsu, or Japanese finger ("Shi") pressure ("atsu") massage, is an adaptation of acupressure. It promotes the use of finger pressure along meridian points to release blockages in the flow of energy ("ki" in Japanese). Swedish massage involves variation in pressure applied to the body by five basic strokes; effleurage (stroking), petrissage (grasping muscle groups and stretching, rolling or kneading them), thumb work (local pressure using thumbs), vibration (shaking of the hands over muscle groups back and forth), and percussion (tapping or using a chopping motion with hands).²¹

Cave paintings discovered in the Pyrenees indicate that more than 15,000 years ago massage was used to treat injuries.²¹ Ancient Chinese and Ayurvedic physicians prescribed massage as early as 3000 years ago. Hippocrates, in the 4th century B.C., is recorded to have said, "The physician must be experienced in many things, but most assuredly in rubbing."²¹

The benefits of massage are believed to result from release of serotonin, and decreases in levels of cortisol and catecholamines.^{53,54} In addition, massage may increase parasympathetic stimulation, resulting in increased alertness and improved performance of cognitive tasks.⁵³

There are studies reporting benefits of massage therapy in the management of pregnant women with labor pains, for pain and anxiety reduction in adult patients undergoing burn debridement, and for treating insomnia in critically ill older men.⁵⁵⁻⁵⁷ Studies in children have reported benefits in the management of bulimia, juvenile rheumatoid arthritis, attention deficit hyperactivity disorder, atopic dermatitis, and reduction of anxiety in children with cystic fibrosis.⁵⁸⁻⁶²

Recently, an evaluation of the benefits of massage therapy for the treatment of children with asthma was conducted.⁶³ Thirty-two children with asthma, between the ages of 4 and 14 years, were randomized to receive either 20 minutes of massage or relaxation therapy daily for one month. The children were further divided into a young group (6-8 years) and an older group (9-14 years). The parents and children self-reported feelings of anxiety before and after treatment. The children were also videotaped during the 30 minutes before and after treatment. Videotapes were scored by researchers who were blind to treatment groups for affect (facial expression), anxiety (fidgeting to relaxed state), activity (extremes in activity to moderate activity), and vocalizing (negative to positive). Salivary cortisol levels were measured

before treatments on day 1 and 30. Pulmonary function testing was performed using a spirometer on the first and last day of the study. The investigators reported a significant reduction in the forced expiratory flow (25-75%) after massage therapy in both age groups. The younger children who received massage therapy demonstrated an immediate decrease in behavioral anxiety and in cortisol levels. Older children reported lower anxiety after massage therapy.

The benefits of massage therapy for promoting growth and development of preterm and/or low birth-weight infants have not been well established.⁶⁴ A recent meta-analysis of published data recognizes a positive effect of massage on daily weight gain (5 gm, 95%, CI 3.5-6.7 gm), but not with touch therapy (-2 gm, 95%, CI 2.4-1.9 gm).⁶⁴ Massage also appeared to result in reduction of length of stay in the hospital (decrease of 4.6 days, 95%, CI 2.6-6.6 days). Further, there is some evidence that suggests massage therapy may have a positive effect on decreasing postnatal complications and improving weight gain at 4-6 months follow-up.

There are few contraindications to massage therapy.⁵³ Massage therapy is not recommended in the pregnant patient, during an acute illness, in patients with thrombophlebitis or in patients who have varicose veins.²¹

Naturopathy

Naturopathy involves the treatment of disorders using diet, herbal medicines, and environmental modifications. The use of aromatic oils also is considered part of naturopathy. The use of plants and aromatic oils for healing purposes predates human history and forms the origin of much of modern medicine. Many conventional drugs originate from plant sources. Examples include aspirin (from willow bark), digoxin (from fox-glove), quinine (from cinchona bark), and morphine (from the opium poppy).

Herbal remedies come in many forms, including teas, oils, bulk, tablets, and tinctures. Remedies are prepared using either the whole plant or portions of the plant (leaves, berries, roots, etc.) or by combining several different herbs together. Herbal medicines traditionally were thought to work because they contained identifiable, active pharmacological ingredients that were already in standard use. However, new pharmacological ingredients continue to be identified. Some herbal practitioners believe that it is the milieu in which the plant component sits that makes it useful, not necessarily the pharmacological ingredients contained in the plant.

Some of the more commonly used herbal remedies in both children and adults include St. John's wort, echinacea, *Ginkgo biloba*, and ma huang. Table 4 lists herbal remedies and the clinical indications for which they most often are used.

There has been conflicting scientific evidence supporting the use of herbal remedies. In a prospective, randomized clinical trial, honey was compared to silver sulfadiazine for the treatment of burns.⁶⁵ Honey was found to promote greater epithelialization and wound healing than silver sulfadiazine and fewer patients treated with honey had a wound infection.

Table 5. Potential Interactions between Herbal Preparations and Conventional Drugs

HERB	CONVENTIONAL DRUG	PROBLEM
Echinacea	Methotrexate, ketoconazole	Hepatotoxicity
Feverfew, garlic, ginseng gingko, ginger	Warfarin	Altered bleeding time
Ginseng	Estrogens, corticosteroids	Additive effects
Ginseng	Insulin, sulphonylureas	Altered glucose concentrations
Liquorice	Digoxin	Interferes with pharmacodynamics
Liquorice	Spironolactone	Antagonistic of diuretic effect
Echinacea, zinc	Immunosuppressants	Antagonistic effects
St. John's wort	Iron	May limit absorption

A randomized, placebo-controlled trial evaluating the use of zinc gluconate glycine lozenges in the treatment of children with cold symptoms found no symptomatic benefit.⁶⁶ Garlic extract therapy was found to have no significant effect on cardiovascular risk factors for pediatric patients with familial hyperlipidemia in a randomized, double-blind, placebo-controlled clinical trial.⁶⁷

Infants with colic who were enrolled in a double-blind, randomized, controlled clinical trial were significantly better when treated with an herbal tea containing chamomile than when they were given a placebo.⁶⁸ No well-controlled studies have yet been conducted to evaluate the use of echinacea in the treatment of children with common ailments.⁶⁹

Many individuals believe that herbal remedies are inherently without risk because they are natural. However, many herbal remedies have been associated with adverse effects, and a number of patients have experienced adverse interactions between prescription or over-the-counter medications and herbal remedies.⁷⁰⁻⁷² As well as their direct pharmacological effect, herbal products may be contaminated, adulterated, or misidentified. Interestingly, because of standardization in the herbal industry, the potency of herbal remedies is increasing. Examples of side effects or complications noted with herbal remedies include licorice causing high blood pressure or hypokalemia, goldenseal decreasing serum glucose, feverfew causing mouth ulcers, and black cohosh causing migraines. Ma huang, which contains the herb ephedra and its active ingredient ephedrine, has been reported to cause myocardial infarction, hypertension, dysrhythmias, seizures, hypertension, and stroke.⁷³ Table 5 lists important potential interactions between herbal preparations and conventional drugs.

Many individuals use aromatic oils to treat common ailments. The pathophysiology by which aromatic oils supposedly work is not known, although oils have been shown to increase alpha and beta waves on electroencephalogram.

Aromatherapy has been used to treat a wide variety of medical problems, including the common cold, allergies, headaches, and depression. However, there has been little systematic scientific evaluation of the use of aromatic oils, especially in chil-

dren. Of published studies, none support their use.

Regulations

Issues related to regulations and licensure have been raised regarding the use of CAM therapies for the treatment of both adults and children. Chiropractors are licensed in all 50 states and the District of Columbia.⁷⁴ Forty-two states mandate coverage of chiropractic services in health insurance policies. As of 1993, more than 45,000 licensed chiropractors were practicing in the United

States.⁷⁵ Massage therapists are currently licensed in 27 states.⁷⁵ The FDA currently recognizes and regulates homeopathic remedies.⁷⁵ Four states license homeopaths, and 14 states license naturopaths.⁷⁴ Eleven states require that naturopaths complete a four-year postgraduate training at one of the country's four Department of Education-accredited naturopathic medical schools.⁷⁶

As of 1998, 29 states plus the District of Columbia have used the National Certification Commission for Acupuncture and Oriental Medicine certification as an integral part of their licensure process for the practice of acupuncture. Some states have set additional eligibility criteria. A small number of states have set additional jurisprudence or practical examination requirements. Seven states mandate insurance coverage of acupuncture services.⁷⁴ The U.S. FDA recently began to regulate acupuncture needles for manufacturing practices and single-use sterility standards.⁷⁵

While prescription and over-the-counter drugs are required to go through a lengthy premarket approval process addressing safety issues, such requirements do not currently apply to herbal remedies.⁷⁷ In addition, while manufacturers cannot legally claim that these products prevent, treat, or cure a specific disease, they can make claims about function that consumers may misinterpret.⁷⁸ As a result, issues related to good manufacturing practices, labeling and postmarketing surveillance have been raised concerning herbal remedies. Some herbal remedies have been found to contain lead, arsenic, and other heavy metals, as well as pharmaceutical agents, such as steroids and benzodiazepines.⁷⁹

Manufacturers of herbal remedies are not required to include uses, dosages, possible side effects, toxicity, or contraindications on package labels, and postmarketing surveillance for adverse reactions has been limited.⁷⁷ The FDA published proposed regulations for good manufacturing practices for dietary supplements.⁸⁰ These regulations would apply to herbal remedies.

Congress and the NIH have become interested in CAM use in the United States. The Office of Alternative Medicine (OAM), recently renamed the National Center for Complement-

Table 6. Websites About CAM Therapies

THE UNIVERSITY OF TEXAS CENTER FOR ALTERNATIVE MEDICINE RESEARCH http://www.sph.uth.tmc.edu/utcam/default.htm
CENTER FOR COMPLEMENTARY AND ALTERNATIVE MEDICINE http://www-camra.ucdavis.edu/
PHYTOCHEMICAL AND ETHNOBOTANICAL DATABASES http://www.ars-grin.gov/duke/
NATIONAL INSTITUTES OF HEALTH, OFFICE OF ALTERNATIVE MEDICINE http://altmed.od.nih.gov/
QUACKWATCH http://www.quackwatch.com/
FDA GUIDE TO CHOOSING MEDICAL TREATMENTS http://www.fda.gov/oashi/aids/fdaguide.html

tary and Alternative Medicine, was first initiated through Congressional mandate under the 1992 NIH Appropriations Bill.⁸¹ The OAM was organized to facilitate the evaluation of alternative medicine treatment modalities and to determine their effectiveness. The OAM identifies and evaluates unconventional health care practices and supports and conducts research and research training on these practices and disseminates information on their clinical usefulness, scientific validity, and theoretical underpinnings.

Summary

More and more individuals are turning to CAMs for medical care. As a result, many children are being treated with them as well. Emergency medicine physicians must be aware of the many different types of CAM therapies available, their uses, their potential problems, and the availability of scientific evidence supporting or refuting their use. Table 6 lists Internet websites that provide information on CAM therapies. These sites provide useful information for clinicians who take care of children who have been or are being treated with a CAM therapy.

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CME Questions

29. The most common alternative therapy used to treat children is:
- chiropractic.
 - massage therapy.
 - acupuncture.
 - herbal remedies.
30. The most common reason parents use CAM therapies to treat their children is:
- fear of drug side effects.
 - dissatisfaction with conventional medicines.
 - presence of a chronic medical condition.
 - word of mouth advice from parents or friends.
31. Children who are treated with a CAM therapy are likely to:
- have a parent who also uses a CAM therapy.
 - not be well-educated.
 - be from low-income families.
 - have parents who don't use CAM therapies.
32. Chiropractic medicine has been found to be effective in the treatment of:
- otitis media.
 - asthma.
 - musculoskeletal complaints.
 - seizures.
33. Parents who practice homeopathy should be questioned about:
- recent manipulations.
 - the sterility of needles.
 - massage points utilized.
 - the child's vaccinations.
34. Acupuncture has been scientifically shown to cause the release of:
- endogenous opioids.
 - epinephrine.
 - norepinephrine.
 - GABA.
35. Chamomile has been used to treat:
- asthma.
 - colic.
 - migraine headaches.
 - depression.
36. Chiropractors are licensed in all 50 states.
- True
 - False
37. What side effect may be associated with the use of goldenseal?
- Hypokalemia
 - High blood pressure
 - Decreasing serum glucose
 - Mouth ulcers

38. Which of the following are potential side effects of ma huang?
- Myocardial infarction
 - Hypertension
 - Seizures
 - All of the above

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