

Complementary and Alternative Medicine



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The objective of medicine is to address people's unavoidable needs for emotional and physical healing. The discipline has evolved over millennia by drawing on the religious beliefs and social structures of numerous indigenous peoples, by exploiting natural products in their environments, and more recently by developing and validating therapeutic and preventive approaches using the scientific method. Public health and medical practices have now advanced to a point at which people can anticipate—and even feel entitled to—lives that are longer and of better quality than ever before in human history.

Yet despite the pervasiveness, power, and promise of contemporary medical science, large segments of humanity either cannot access its benefits or choose not to do so. More than 80 percent of people in developing nations can barely afford the most basic medical procedures, drugs, and vaccines. In the industrial nations, a surprisingly large proportion of people opt for practices and products for which proof as to their safety and efficacy is modest at best, practices that in the aggregate are known as *complementary and alternative medicine* (CAM) or as *traditional medicine* (TM).

Much of this book considers the formidable challenges to advancing human health through the further dispersion of effective and economical medical practices. This chapter considers both proven and unproven but popular CAM and TM approaches and attempts to portray their current and potential place in the overall practice of medicine.

With globalization, the pattern of disease in developing countries is changing. Unlike in the past, when communicable diseases dominated, now 50 percent of the health burden in developing nations is due to noncommunicable diseases,

such as cardiovascular diseases, diabetes, hypertension, depression, and use of tobacco and other addictive substances. Because lifestyle, diet, obesity, lack of exercise, and stress are important contributing factors in the causation of these noncommunicable diseases, CAM and TM approaches to these factors in particular will be increasingly important for the development of future health care strategies for the developing world.

DEFINITIONS AND DOMAINS OF COMPLEMENTARY AND ALTERNATIVE MEDICINE AND TRADITIONAL MEDICINE

We refer to medical practices that evolved with indigenous peoples and that they have introduced to other countries through emigration as traditional medicine. We refer to approaches that emerged primarily in Western, industrial countries during the past two centuries as scientific or Western medicine, although we acknowledge that not all Western medicine is based on scientifically proven knowledge. The terms *complementary* and *alternative* describe practices and products that people choose as adjuncts to or as alternatives to Western medical approaches. Increasingly, the terms *CAM* and *TM* are being used interchangeably (Kaptchuk and Eisenberg 2001; Straus 2004).

Endless varieties of practices are scientifically unproven and poorly accepted by medical authorities. For the sake of organizing an agenda for research into these approaches, the U.S. National Institutes of Health has grouped them into five

somewhat overlapping domains (<http://nccam.nih.gov/health/whatiscam>) as follows:

- *Biologically based practices.* These include use of a vast array of vitamins and mineral supplements, natural products such as chondroitin sulfate, which is derived from bovine or shark cartilage; herbals, such as ginkgo biloba and echinacea; and unconventional diets, such as the low-carbohydrate approach to weight loss espoused by the late Robert Atkins.
- *Manipulative and body-based approaches.* These kinds of approaches, which include massage, have been used throughout history. In the 19th century, additional formal manipulative disciplines emerged in the United States: chiropractic medicine and osteopathic medicine. Both originated in an attempt to relieve structural forces on vertebrae and spinal nerve roots that practitioners perceived as evoking a panoply of illnesses beyond mere musculoskeletal pain.
- *Mind-body medicine.* Many ancient cultures assumed that the mind exerts powerful influences on bodily functions and vice versa. Attempts to reassert proper harmony between these bodily systems led to the development of mind-body medicine, an array of approaches that incorporate spiritual, meditative, and relaxation techniques.
- *Alternative medical systems.* Whereas the ancient Greeks postulated that health requires a balance of vital humors, Asian cultures considered that health depends on the balance and flow of vital energies through the body. This latter theory underlies the practice of acupuncture, for example, which asserts that vital energy flow can be restored by placing needles at critical body points.
- *Energy medicine.* This approach uses therapies that involve the use of energy—either biofield- or bioelectromagnetic-based interventions. An example of the former is Reiki therapy, which aims to realign and strengthen healthful energies through the intervention of energies radiating from the hands of a master healer.

Alternative systems of medicine use elements from each of these CAM and TM domains. For example, traditional Chinese medicine incorporates acupuncture, herbal medicines, special diets, and meditative exercises such as tai chi. Ayurveda in India similarly uses the meditative exercises of yoga, purifying diets, and natural products. In the West, homeopathic medicine and naturopathic medicine each arose in the late 19th century as reactions to the largely ineffectual and toxic conventional approaches of the day: purging, bleeding, and treatments with heavy metals such as mercury and arsenicals.

DEMOGRAPHY, USE, TOXICITY, AND EFFICACY

The use of CAM and TM varies widely between and within countries. The World Health Organization (WHO) has published and

Table 69.1 Estimated Use of CAM and TM by Patients and Practitioners Worldwide

Region or country	Extent of use
Africa	Used by 80 percent of the population for primary health care
Australia	Used by 49 percent of adults
China	Accounts for 30 to 50 percent of total health care Fully integrated into the health system 95 percent of Chinese hospitals have TM units
India	Widely used 2,860 hospitals provide TM
Indonesia	Used by 40 percent of the entire population Used by 70 percent of the rural population
Japan	72 percent of physicians practice TM
Thailand	TM integrated into 1,120 health centers
Vietnam	Fully integrated into the health care system 30 percent of the population is treated with TM
Western countries	CAM and TM not strongly integrated into the health care system France: at least 75 percent of the population has used CAM at least once Germany: 77 percent of pain clinics provide acupuncture United States: 29 to 42 percent of population uses CAM

Source: WHO 2002.

summarized numerous surveys of use (table 69.1). In developing nations, TM is the sole source of health care for all but the privileged few. By contrast, in affluent countries individuals select CAM approaches according to their specific beliefs. For example, as many as 60 percent of those living in France, Germany, and the United Kingdom consume homeopathic or herbal products. Only 1 to 2 percent of Americans use homeopathy, but 10 percent of adults use herbal medicines, 8 percent visit chiropractors, and 1 to 2 percent undergo acupuncture every year (Ni, Simile, and Hardy 2002). Use of CAM and TM among patients with chronic, painful, debilitating, or fatal conditions, such as HIV/AIDS and cancer, is far higher, ranging from 50 to 90 percent (Richardson and Straus 2002).

There is remarkably little correlation between the use of CAM and TM approaches and scientific evidence that they are safe or effective. For many CAM and TM practices, the only evidence of their safety and efficacy is embodied in folklore. Beginning more than 1,500 years ago, data on the use of thousands of natural products were assembled into impressive monographs in China, India, and Korea, but these compendiums—and similar texts from Arabic, Egyptian, Greek, and Persian sources and their major European derivatives—are merely catalogs of products and their use rather than formal analyses of safety and efficacy.

Table 69.2 Some Natural Products That May Alter Drug Actions

Herbal product	Class of drug
Ephedra (<i>ma huang</i>)	Alpha and beta adrenergics
Garlic	Anticoagulants; some HIV protease inhibitors
Ginkgo biloba extract	Anticoagulants
Glucosamine	Antidiabetics
Saw palmetto	Androgens
St. John's wort	HIV protease inhibitors; some chemotherapy drugs; cyclosporine A; birth control
Valerian	Sedatives

Source: Niggemann and Gruber 2003.

Many people who today choose herbal products in lieu of prescription medications assume that because these products are natural, they must be safe, even when the evidence for this assertion is essentially anecdotal. Recent studies have shown that herbals are highly variable in quality and composition, with many marketed products containing little of the intended ingredients and containing unintended contaminants, such as heavy metals and prescription drugs. A few herbals are banned outright in several countries. Comfrey and kava have been associated with liver failure, aristolochia with genitourinary cancer (De Smet 2002), and ephedra with heart attacks and strokes (Shekelle and others 2003). More important, herbals contain ingredients that can accelerate or inhibit the metabolism of prescription drugs (table 69.2). The most notorious of these is St. John's wort, which affects the metabolism of nearly 50 percent of all prescription drugs (Markowitz and others 2003). The cumulative data on the pharmacological and potential adverse effects of herbal supplements now dictate that patients discuss their use of supplements with knowledgeable practitioners before initiating treatment.

As to evidence of the efficacy of CAM and TM approaches, thousands of small studies and case series have been reported over the past 50 years. Few were rigorous enough to be at all compelling, but they are sufficient to generate hypotheses that are now being tested in robust clinical trials. The existing body of data already shows that some approaches are useless, that for many the evidence is positive but weak, and that a few are highly encouraging (table 69.3).

ECONOMICS OF COMPLEMENTARY AND ALTERNATIVE MEDICINE AND TRADITIONAL MEDICINE

Although social, medical, and cultural reasons may account for why people in a given country prefer CAM and TM to conventional (Western) medicine, economic forces are also at play.

This section describes the socioeconomic determinants of seeking treatment from traditional healers and providers of CAM; reviews the evidence on the cost-effectiveness of CAM and TM; and discusses cost-effective approaches to regulating, improving, and expanding the use of CAM and TM. Much of this evidence is from industrial countries; few studies have been conducted in or are applicable to low- and middle-income countries. This caveat is important for two reasons. First, the CAM and TM modalities discussed in this section may not be used in many developing countries. Second, the limited data on cost-effectiveness may not be applicable in the case of those countries. Nevertheless, the data give a rough picture of the relative cost-effectiveness of a number of CAM and TM practices.

Economic Factors That Influence the Use of Complementary and Alternative Medicine and Traditional Medicine

Users of CAM and TM approaches choose health practices that resonate with their beliefs about health (Astin 1998). Although economic factors play a role in this choice, the underlying incentives are not always predictable. For instance, a common misconception is that patients opt for CAM and TM services because they are cheaper alternatives to conventional medical care. Even though there are certainly instances when the cost of treatment using CAM or TM is much cheaper than the cost of accessing a conventional medical service, several studies have found that CAM and TM cost the same or more than conventional treatments for the same conditions (see, for example, Muela, Mushi, and Ribera 2000).

At least one study has shown that financial considerations are rarely the primary factor in choosing a traditional healer, ranking behind such reasons as confidence in the treatment, ease of access, and convenience (Winston and Patel 1995). In the United States, the average cost of a single visit to a Navajo healer was US\$388, and the average annual cost of using a traditional healer represented roughly a fifth of the reported annual income of respondents in a survey (Kim and Kwok 1998). The high cost of using a healer was cited as the most common barrier to seeking care from this source. In Kenya, the average charge per patient per visit to a TM practitioner was K Sh 46 (US\$4 in 1981), which was significantly greater than the average charge per visit even in private health care facilities (Mwabu, Ainsworth and Nyamete 1993). Finally, a survey in Zimbabwe reported that the median cost of consulting an herbalist was Z\$23 per visit, compared with Z\$1 for a government clinic and Z\$29 for a private doctor (Winston and Patel 1995). The same survey found that outcomes tended to be better when patients went to government clinics (67.3 percent of visits resulted in a good outcome) than when patients consulted herbalists (50 percent of visits resulted in a good outcome).

TM is not always more expensive than conventional medicine, however. Survey respondents in Ghana reported that the

Table 69.3 Levels of Evidence for the Efficacy of Selected CAM and TM Approaches

CAM or TM approach	Potential use	Study outcome	Level of evidence	Source
<i>Artemisia annua</i>	Treating drug-resistant malaria	Positive	A	van Agtmael, Eggelte, and van Boxtel 1999
Black cohosh	Controlling menopausal symptoms	Mixed	B	Kronenberg and Fugh-Berman 2003
Cranberry	Preventing urinary tract infection	Positive	B	Jepson, Mihaljevic, and Craig 2000
Echinacea	Preventing or treating viral colds	Mixed	B	Barrett 2003; Taylor and others 2003
Garlic	Lowering blood cholesterol	Positive	C	Le Bars and others 1997
Ginkgo biloba extract	Preventing or treating dementia	Mixed	B	Kanowski and Hoerr 2003
Ginseng	Improving energy and immunity against infection	Mixed	C	Richy and others 2003
Glucosamine	Relieving osteoarthritis	Positive	A	Reginster, Deroisy, and Rovalty 2001
Hawthorn	Improving cardiac function	Mixed	B	Pittler, Schmidt, and Ernst 2003
Milk thistle	Improving liver function	Positive	C	Jacobs and others 2002
St. John's wort	Treating moderate to severe depression	Negative	A	Hypericum Depression Trial Study Group 2002
	Treating mild depression	Positive	B	Di Carlo and others 2001
Saw palmetto	Relieving symptoms of benign prostatic hypertrophy	Positive	B	Gerber and others 2001
Acupuncture	Relieving arthritis pain	Positive	B	Berman and others 1999
	Relieving the pain of tooth extraction	Positive	B	Lao and others 1995
	Treating hypertension	Mixed	C	Chiu, Chi, and Reid 1995
	Relieving nausea from chemotherapy	Positive	A	Shen and others 2000
	Relieving addiction withdrawal	Mixed	B	Margolin and others 2002
	Treating asthma	Negative	B	Linde, Jobst, and Panton 2000
Meditation	Decreasing anxiety	Positive	B	Specia and others 2000
	Decreasing blood pressure	Mixed	B	Schneider and others 1995
Biofeedback	Preventing migraine	Positive	B	Holroyd and Penzien 1990
Homeopathy	Treating asthma	Mixed	B	White and others 2003
	Treating gastroenteritis	Positive	C	Jacobs and others 2003
Magnet therapy	Treating plantar fasciitis	Negative	B	Winemiller and others 2003
Chiropractic	Treating lower back pain	Positive	B	Cherkin and others 2003

Source: Authors.

A = multiple high-quality, randomized, controlled trials; B = single high-quality trials or smaller, less rigorous trials; C = weaker clinical trials; Mixed = conflicting results among studies of similar quality.

cost of malaria treatment at a health clinic ranged from €1,900 to €3,000 (US\$1.30 to US\$2.00 in 1997), treatment at home using drugs bought from pharmacies or health care workers ranged between €200 and €1,000 (US\$0.10 to US\$0.70), and treatment by an herbalist was virtually free (Ahorlu and others 1997).

Another common misconception is that the poor are more likely to use TM. At least one study shows that this may not be true. In Zimbabwe, the mean monthly income of households visiting an herbalist, Z\$877, was greater than the mean monthly income of households using government clinics, Z\$718 (Winston and Patel 1995).

Although some traditional healers charge more than conventional practitioners, their fees may be negotiable, the method of payment may be flexible (often on credit or in

exchange for labor), and payment may be contingent on outcome. The availability of an outcome-contingent contract favors TM over Western medicine when the disease condition requires providers to both exert effort in curing patients and induce patients to comply with their recommendations. Nonetheless, this strategy may be difficult to apply to the larger health care system.

Furthermore, patients tend to seek care from traditional healers for conditions such as mental illness, impotence, and chronic disorders, which they perceive as requiring greater involvement by the extended family and kinship group. Accordingly, the availability of financial support for seeking treatments for these disorders is greater than it is for illnesses such as malaria or diarrhea, for which patients more often seek conventional treatment.

Few published data are available on the financial costs of TM in low- and middle-income countries. The data presented here on the use of traditional healers are extracted from the World Bank's living standards surveys in Vietnam to provide one nationally representative snapshot of the situation. Of 28,254 individuals in the sample, 10,033 had consulted a health care provider in the four weeks preceding the survey. These consultations included both home visits and visits to a provider. Of the 10,033, 1,829 had been to a public provider, 1,431 to a private provider, 7,650 to a pharmacy, and 259 to a traditional healer.¹ The most common reasons for visiting a traditional provider were headache, followed by cough and fever. The per visit drug cost for consulting a traditional healer was D 46, and the total cost per visit was D 51, compared with drug costs of D 38 and total costs of D 41 for going to a private clinic.

One commonly cited motivation for using CAM and TM is that their use might lower the incidence and costs of side effects associated with conventional treatments, but the published evidence on this point remains mixed. There is some evidence that CAM is used in addition to conventional treatments (Thomas and others 1991), but CAM may also have the effect of displacing conventional treatments. An outpatient survey found that, of 246 patients who had been receiving conventional treatment from the Royal London Homeopathic Hospital since the onset of care, a third had halted their conventional treatment and another third had reduced their intake of conventional medication (van Haselen 2000).² The extent to which homeopathic treatment displaced conventional treatment varied by indication. The use of homeopathic treatment often replaced conventional treatments in patients with skin and respiratory infections; in patients with cancer, its use was purely complementary and therefore added to overall health care costs.

Thomas and others (1991) observe that patients who use CAM and TM also commonly access conventional medical care. In industrial countries, most CAM usage complements conventional care, but this is also common in developing nations. For instance, Mwabu (1986) provides evidence from Kenya that patients are likely to use more than one type of provider from the range of those available, such as government facilities, mission clinics, private clinics, pharmacies, and traditional healers. Furthermore, the choice of provider depends on patients' illness, condition, socioeconomic status, and education. If an initial visit to one kind of provider did not resolve the disease satisfactorily, a follow-up visit was made to a different kind of provider. Finally, the quality of care—including efficiency of service and waiting time at government and private clinics—is an important determinant of whether patients choose to go to traditional healers. Most traditional healers surveyed in a second study referred patients to Western practices for treatment when necessary (Mwabu, Ainsworth, and Nyamete 1993).

Economic Evidence

Although most studies tend to focus on a specific CAM or TM practice, Sommer, Burgi, and Theiss (1999) looked more broadly at whether the provision of CAM and TM services through prepaid health plans or government insurance reduces the overall costs of health care and found that it does not. A possible reason is that few individuals who are offered access to CAM use them, and those who do might access those services in addition to, not in place of, more conventional health services.

Studies that compare the cost-effectiveness of different CAM and TM approaches using the same analytical framework are rare. One such study in Peru looked at the costs and cost-effectiveness of treatment using conventional medicine and TM (EsSalud and OPS 2000). Complementary medical practices evaluated included acupuncture, homeopathy, tai chi, meditation, reflexology, hydrotherapy, naturopathy, and massage. Patients were enrolled in either the Western medicine group or the CAM group. Patients were not randomized between the two treatment groups, but they were matched by disease pathology and severity, age, and sex. Furthermore, selected patients had completed at least one year in the health system, as the investigators reasoned that this would enable them to evaluate their follow-up. Overall, the investigators found that complementary medicine was between 53 and 63 percent less expensive than conventional medicine for achieving equivalent levels of effectiveness. Complementary medicine was especially cost-effective for osteoarthritis, hypertension, facial paralysis, and peptic ulcers.

The rest of this section looks at the economic evidence on specific forms of CAM or TM.

Acupuncture. Lindall's (1999) study finds that an acupuncture referral for musculoskeletal conditions costs a mean of US\$422, roughly 60 percent less than the cost of referral to a Western practitioner. However, this study was not randomized, and patients had to have failed first-line drug treatment before being offered the choice of second line-treatment, either with acupuncture or with Western medicine.

Homeopathy. Evidence indicates that the cost of homeopathic medication is lower than the average cost of allopathic products, which would be an economic factor in favor of its use if homeopathy were proven to be effective. A study by the National Health Service in the United Kingdom found that the drug costs associated with homeopathy were lower than those of allopathic practitioners (Swayne 1992). A four-year study of 100 patients that compared homeopathic drug costs with those of conventional drugs found an average cost saving of US\$96 during the study period for those using homeopathic drugs (Jain 2003).³

Ayurveda. A study that compared medical expenditures over a four-year period for participants in a comprehensive program of ayurvedic-based natural medicine (which included antioxidant strategies, mind-body medicine, and other techniques) with participants whose expenditures were covered through a BlueCross BlueShield health insurance plan found that the expenditures for the ayurvedic group were 50 percent lower per person (Orme-Johnson and Herron 1997). However, the study was not randomized and failed to control for the inclination of only a subset of people to accept and remain compliant with ayurvedic approaches.

Chiropractic. Some studies found that spinal manipulation is less expensive than conventional treatments for episodes of back pain. One nonrandomized study found that the cost of chiropractic treatment over a five-year period, including both provider costs and equipment costs (US\$28,902), was 24 percent less than the cost of Western pain therapy (US\$38,029) (Kumar, Malik, and Demeria 2002). Moreover, 15 percent of patients in the chiropractic group were able to return to work, compared with none in the control group.

However, other larger and better-controlled studies failed to find a difference between chiropractic and physical therapy in terms of either outcomes or costs (Cherkin and others 1998; Skargren and others 1997; Skargren, Carlsson, and Oberg 1998). A study of adults with low back pain who were randomly assigned to physical therapy or chiropractic manipulation or were just given an educational booklet found no significant differences in either the mean costs of care or the outcomes between the physical therapy and chiropractic groups (Cherkin and others 1998). Three-quarters of the participants in these groups—who incurred costs of roughly US\$430 over the two-year period of the study—reported that their outcome was either good or excellent, compared with a third of those who were assigned booklets; however, the mean cost of care for the booklet group was only US\$153 for the two-year period.

Mind-Body Treatments. Little evidence is available on the cost-effectiveness of practices such as meditation and yoga, but the cost of acquiring the skills required for these practices, as well as the time costs of practicing them, are so low relative to conventional medicine that evidence of their clinical effectiveness might suffice to justify their use on economic grounds. Available evidence from clinical studies suggests that mind-body treatments can be cost-effective (Caudill and others 1991; Friedman and others 1995; Hellman and others 1990; Sobel 1995). Blumenthal and others (2002) find significant declines in coronary events and in predicted costs of care for patients who were assigned to a one-and-a-half-hour long weekly class on stress management, relative to usual care for each of the first two years of follow-up and after five years.

Beyond Cost-Effectiveness: Ancillary Benefits and Costs of CAM and TM

Although cost-effectiveness is one guiding rationale for determining resource allocations for expanding (or restricting) access to CAM and TM, additional societal benefits and costs, such as effects on biodiversity, must also be considered. CAM and TM could provide a rationale for conserving species, but overharvesting of endangered species for medicinal purposes is also a concern. According to WHO, 85 percent of the world's population (principally those in developing countries) depends on plants for medicine, and 25 percent of prescription drugs have an active ingredient derived from a flowering plant (Cox 2001). The possible extinction of medicinal plants is of concern not only to developing countries but also to industrial countries, as in the cases of poaching of American ginseng and overharvesting of native saw palmetto. Similarly, the reliance of Chinese TM on tiger genitals, bear gallbladders, and black rhinoceros horns has played an important role in poaching and threatens to wipe out these mega fauna.

Local knowledge and culture regarding the uses of medicinal plants may be important determinants of whether a certain species will survive (Etkin 1998). In addition to the biodiversity value of these saved species, scientists may be able to analyze these plants for potential clinical application on a broader scale than TM permits. Although preserving traditional knowledge of healing practices helps preserve the culture and identity of indigenous populations, CAM and TM may impose significant costs. In such instances, promoting conventional treatments that do not depend on endangered species may bring important benefits to society.

EXPANDING THE BENEFICIAL USE OF COMPLEMENTARY AND ALTERNATIVE MEDICINE AND TRADITIONAL MEDICINE

Despite the uncertainty about the clinical efficacy and cost-effectiveness of certain CAM and TM practices, expansion of their use in instances in which moderate evidence of their efficacy and good evidence of their safety exists could yield health, social, and economic benefits. A number of surveys show that local pharmacies are the primary source of treatment for many ailments, especially in rural areas where government or private clinics are less accessible. In these situations, improving the quality of TM might serve as an effective substitute for allowing the unregulated use of conventional medical treatments. Training traditional healers is substantially less expensive than training doctors or nurses. A study of 52 traditional healers interviewed as part of a survey in Kenya estimated that the average out-of-pocket (cash) costs of training to be a traditional healer were K Sh 418 (US\$40 in 1981) (Mwabu, Ainsworth, and Nyamete 1993).

Traditional healers can also be recruited into a more broadly based system for delivering public health; for example, with additional training, traditional healers can serve as primary health care workers (Hoff 1997) and provide advice on such matters as sexually transmitted diseases and oral rehydration therapy (Nations and de Souza 1997; Nations and others 1988; Ndubani and Hojer 1999). In addition, permitting access to CAM and TM within the context of the conventional health care system would facilitate access to multiple health services at one location.

Comprehensive policy on CAM and TM is lacking in most countries, including the United States. According to the 1994 Dietary Supplement, Health, and Education Act, the U.S. Food and Drug Administration cannot require proof that dietary supplements and herbal products are safe and effective before they are sold, although it is charged with requiring good manufacturing practices. The quality of herbal products is not regulated, and herbal products typically differ from source to source and from batch to batch in terms of their component ingredients and respective amounts and in terms of whether they contain contaminants. In the United States, no single entity is responsible for all aspects of CAM and TM control, education, information, and research, and no national, voluntary system of self-regulation exists. National nongovernmental organizations, such as the Accreditation Commission for Acupuncture and Oriental Medicine, the American Board of Medical Acupuncture, the Council of Chiropractic Education, the Council of Homeopathic Education, and the Commission on Massage Therapy Accreditation, accredit education in some CAM and TM fields, but such accreditation bodies do not exist in many developing countries. Nearly all countries lack rigorous research training programs in CAM and TM.

A common misperception is that in the developing world CAM and TM is used primarily by poorer, uneducated populations, while in industrial countries it is used more by affluent and better-educated segments of the population (Eisenberg and others 1998). In both settings, relatively little evidence supports this view. Many investigators have failed to critically assess the use of CAM and TM by minority and immigrant populations in Western nations. In Africa, nearly 85 percent of the population uses TM, often as the only way to obtain primary health care, and wealthier people in developing countries often use TM (WHO 2002). Investments in improving the quality and consistency of TM could reduce the cost of health care delivery, especially for chronic conditions such as arthritic pain and AIDS, where TM interventions may improve patients' sense of well-being, appetite, and energy. At the same time, in the absence of resources to extend the public health infrastructure, a network of certified CAM and TM providers could provide the infrastructure for delivering other care, such as immunizations and maternal-child health programs.

Recognizing the redistributive nature of investment in TM is important. Indigenous people will seek the help of traditional healers because of proximity, familiarity, and trust. Investments in TM could therefore be used strategically to increase access to conventional preventive and therapeutic care. Including the traditional healer as part of the health care team may thus be an important strategy both to attract patients and to upgrade the skills and training of traditional healers.

How equity is affected by the proportions in which different condition-specific interventions are combined and how other interventions (regulations, tax policy, managerial changes) are likely to affect equity need to be studied. Given that the majority of indigenous populations in developing countries use TM for their primary health care, the availability, safety, and affordability of TM, including herbal medicines, should be ensured as a matter of equity. One way to do this is by supporting local production of safe and effective herbals such as artemisia at affordable prices. In addition, rigorous research on TM should be supported. WHO is currently conducting collaborative studies on herbal treatments for HIV/AIDS, malaria, sickle cell anemia, and diabetes. Ineffective or unsafe herbal products identified by such studies should be removed from use, while those with proven efficacy and safety should be made available for therapeutic use.

LESSONS LEARNED AND IMPLEMENTATION

The pervasiveness of different modalities of TM and CAM varies greatly from country to country. For example, in China, where traditional Chinese medicine is well integrated into the health system, many different modalities may be used to treat a given condition. In the United States, by contrast, CAM programs are slowly being integrated with conventional medicine. Several medical schools have nascent CAM programs and have integrated them into medical school curricula to differing degrees. One of the more acclaimed programs of this kind in the United States is that developed by Andrew Weil at the University of Arizona Health Sciences Center. His Integrative Medicine Fellowship Program trains physicians in CAM and TM and strives to produce a new delivery model whereby physicians, patients, and nurses form a healing team for the care of the patient. However, this program needs to be critically evaluated before its adoption by more institutions can be urged.

Despite the complexity, diversity, and controversy surrounding CAM/TM approaches, some notable success stories reveal the influence of globalization, whereby modalities discovered in the developing world have been adopted in the West, with or without modifications, and vice versa.

Artemisinin

Artemisinin is a recently developed, active metabolite of artemisia, an herbal extract that has been used in China for centuries to treat fever. Chinese scientists determined the active ingredient of the herbal in the 1970s, and Western pharmaceutical companies have developed several derivatives as drugs for use against resistant *Plasmodium malaria* (Li and others 2000). Randomized clinical trials have shown that one such drug, dihydroartemisinin-piperazine, is effective against drug-resistant *Plasmodium falciparum* malaria (Hien and Dolecek 2004). Another artemisinin derivative, artesunate, was shown to increase parasite clearance and reduce the gametocyte count when added to existing drugs to combat malaria (Adjuik and others 2004).

Acupuncture

Another CAM and TM modality that has considerable acceptance is acupuncture. Many pain management clinics, hospitals, and academic centers in the West now provide acupuncture services, and some insurance companies reimburse for acupuncture services. Rigorous clinical trials have demonstrative positive efficacy in two areas: (a) management of postoperative nausea and emesis (Shen and others 2000) and (b) amelioration of the pain of chronic osteoarthritis (Ezzo and others 2001; Soeken 2004; Tukmachi and others 2004). Studies providing rational explanations of the mechanisms whereby acupuncture might be achieving its effects complement the evidence about its efficacy; for example, one mechanism of action appears to involve opioid-dependent brain pathways. This kind of two-step process—that is, initial demonstration of clinical efficacy followed by scientific research into the mechanism of action—is one way that CAM and TM will gain scientific acceptance and integration into conventional medicine.

Chiropractic Medicine and Osteopathy

Chiropractic medicine was invented in the American heartland during the waning years of the 19th century. It uses spinal manipulation to treat an array of conditions thought to arise because of abnormal alignment of or stresses on vertebrae, most often in patients with musculoskeletal complaints. Two aspects of chiropractic medicine are success stories. First, even though practitioners of conventional medicine ostracized practitioners of chiropractic medicine in the late 19th century and the first half of the 20th century, it has gradually evolved into a viable healing discipline that is increasingly accepted by the conventional medicine community. The evolution of chiropractic can be compared with that of osteopathy. Osteopathy was developed in the United States in parallel with chiropractic, but the field elected to accommodate rather than reject allopathic techniques.

The second success story is research showing that chiropractic manipulation for low back pain is superior to bed rest, physical therapy, or provision of an educational booklet (Cherkin and others 1998). Chiropractic manipulation has also shown results comparable to those achieved with nonsteroidal, anti-inflammatory drugs in alleviating back pain (Straus 2004).

Homeopathy

Homeopathy is a success in terms of its broad appeal and use, not because of the strength of evidence supporting it. Indeed, few conventional scientists and physicians find homeopathy to be plausible. According to the “principle of similars” underlying homeopathy, practitioners choose remedies that, when given in high concentrations, produce symptoms similar to those that the patient presents with. The substance is then put in solution and serially diluted by as much as 10^{60} , well beyond the point defined by Avogadro’s number (at which a single molecule of the original substance could remain in the solution). Homeopathy claims that the acts of serial diluting and vigorous shaking imprint information into water so that medicinal properties are retained even when no or few molecules of the starting medicine are present.

As implausible as this claim may seem, homeopathy is used worldwide with reported success (Jonas, Kaptchuk, and Linda 2003). Randomized controlled trials have suggested that it might be effective for treating influenza (Vickers and Smith 2000), allergies (Taylor and others 2000), and postoperative ileus (Barnes, Resch, and Ernst 1997). However, critics have questioned the quality and analyses of these trials. Some have questioned the validity of pooling data from trials of different populations, interventions, and outcome measures, as several reviews of homeopathy have done. Jonas, Kaptchuk, and Linda (2003, 393) assert that “there is a lack of conclusive evidence on the effectiveness of homeopathy for most conditions. Homeopathy deserves an open-minded opportunity to demonstrate its value by using evidence-based principles, but it should not be substituted for proven therapies.”

Mind-Body Intervention

The work of David Spiegel at Stanford University on group support for breast cancer patients excited wide interest in the potential value of mind-body interventions (Spiegel and others 1989). The study was a randomized controlled trial with a 10-year follow-up involving 86 women with metastasized breast cancer. A one-year psychosocial intervention consisting of weekly supportive group therapy with self-hypnosis for pain showed that the mean survival time in the treated group was 37 months, compared with 19 months for the control group. Moreover, Spiegel (1994) notes that appropriate psychotherapy (both group and individual) not only reduced depression and

anxiety and improved coping skills, but also saved money by reducing the number of office visits, diagnostic tests, medical procedures, and hospital admittances. Although Spiegel's findings have not been replicated, they do illustrate the potential benefits of mind-body intervention and have led to studies of possible mechanisms through which such interventions may operate.

THE RESEARCH AND DEVELOPMENT AGENDA

The lack of product quality and consistency and the absence of compelling data on the safety and efficacy of most CAM and TM approaches present major challenges to any effort to optimize the distribution of precious health resources. These difficulties also pose opportunities for research. Other formidable challenges include the variability in training, credentialing, and licensing CAM and TM practitioners. Increasingly, efforts are being made in several countries to regulate both products and practitioners. Ultimately, stringent controls on training, practices, and products must be complemented by rigorous research to ascertain which approaches are safe and effective—and for which indications.

The global use and potential effect of CAM and TM practices, the lack of adequate data validating their safety and efficacy, and the existence of highly effective conventional alternatives for many of them dictate that resources should be devoted to fuller characterization and standardization of CAM and TM approaches. Investing precious resources in integrating such approaches further into health care infrastructures can be justified only on the basis of compelling data. This point leads to the question of what constitutes a rational agenda for this work.

For resource-rich industrial nations, one model for CAM and TM research is that being implemented by the National Center for Complementary and Alternative Medicine (NCCAM) of the U.S. National Institutes of Health (<http://nccam.nih.gov>). In 2004, NCCAM planned to invest US\$117 million in research and research training. It is supporting some 800 individual projects at present, including studies of the composition of natural products and their pharmacological effects, studies of the neurobiological mechanisms of acupuncture and the placebo effect, and clinical trials with 30 to 30,000 participants. NCCAM now has a strategic plan for its international programs that emphasizes research, training, and efforts to learn about the rich, indigenous TM heritage. Australia, through a government agency similar to NCCAM, is conducting research and training programs in collaboration with its indigenous people. Although the scope of NCCAM's research agenda is larger than what most other nations could accommodate, its underlying philosophy should be universal. That is, the standards for research into CAM and TM approaches

should be no different from those used in conventional biomedical research.

Both CAM and TM and biomedical practitioners need to understand the strengths, limitations, and contributions of their particular approaches so that they can work together in ways that ensure the best possible care for their patients and the achievement of their shared goals of improved individual and public health. Once these issues have been addressed, countries could devote additional resources to studying those CAM and TM approaches that appear to be the most promising in relation to their most pressing public health problems. Some priority areas for CAM and TM research are widely applicable, including studies of approaches to palliate chronic pain and suffering, relieve depression, help release the grip of addictive substances, and slow the progression of degenerative disorders such as arthritis and dementia.

NOTES

1. Because some individuals had gone to more than one provider during the four-week period, the total comes to more than 10,033.
2. The median duration of current treatment at the Royal London Homeopathic Hospital was three years.
3. This study did not take into account the costs of physician time, the costs of laboratory tests, or patients' costs.

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