

Chiropractic

Origins, Controversies, and Contributions

Ted J. Kaptchuk, OMD; David M. Eisenberg, MD

Chiropractic is an important component of the US health care system and the largest alternative medical profession. In this overview of chiropractic, we examine its history, theory, and development; its scientific evidence; and its approach to the art of medicine. Chiropractic's position in society is contradictory, and we reveal a complex dynamic of conflict and diversity. Internally, chiropractic has a dramatic legacy of strife and factionalism. Externally, it has defended itself from vigorous opposition by conventional medicine. Despite such tensions, chiropractors have maintained a unified profession with an uninterrupted commitment to clinical care. While the core chiropractic belief that the correction of spinal abnormality is a critical health care intervention is open to debate, chiropractic's most important contribution may have to do with the patient-physician relationship.

Arch Intern Med. 1998;158:2215-2224

Chiropractic, the medical profession that specializes in manual therapy and especially spinal manipulation, is the most important example of alternative medicine in the United States and alternative medicine's greatest anomaly.

Even to call chiropractic "alternative" is problematic; in many ways, it is distinctly mainstream. Facts such as the following attest to its status and success: Chiropractic is licensed in all 50 states. An estimated 1 of 3 persons with lower back pain is treated by chiropractors.¹ In 1988 (the latest year with reliable statistics), between \$2.4² and \$4 billion³ was spent on chiropractic care, and in 1990, 160 million office visits were made to chiropractors.⁴ Since 1972, Medicare has reimbursed patients for chiropractic treatments, and these treatments are covered as well by most major insurance companies. In 1994, the Agency for Health Care Policy and Research removed much of the onus of marginality from chiropractic by declaring that spinal manipulation can alleviate low back pain.⁵ In addition, the profession is growing: the number of chiropractors in the United States—now at 50 000—is expected to double by 2010

(whereas the number of physicians is expected to increase by only 16%).⁶

Despite such impressive credentials, academic medicine regards chiropractic theory as speculative at best and its claims of clinical success, at least outside of low back pain, as unsubstantiated. Only a few small hospitals permit chiropractors to treat inpatients, and to our knowledge, university-affiliated teaching centers have not yet granted chiropractors privileges to perform manipulation on patients.⁷⁻⁹ Although the American Medical Association (AMA) no longer prohibits its members from consulting with chiropractors, especially since it was found guilty of conspiracy in this regard (see below), chiropractic's size and power have not translated into complete acceptance.

Contradictions and tensions exist not only between chiropractic and mainstream medicine but within chiropractic itself. Since its inception, chiropractors have disagreed about the definition of the therapy and its scope of practice. Various theories vie for dominance within the profession. A multiplicity of competing adjustment techniques also vie with each other under the rubric of chiropractic. The mode of chiropractic intervention—by means of the hands—and its unique therapeutic niche, primarily pain disorders, seem too narrow

From the Center for Alternative Medicine Research, Department of Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Mass.

a foundation for its claim to encompass a distinct health system with autonomous licensing, credentialing, and educational institutions.

Yet, despite external conflicts and perhaps partly because of them, and despite the intraprofessional disagreements and uncertainty about its scope of practice, chiropractic has found an internal coherence that has allowed it to become an enduring presence in the United States. This integrity has to do with the profession's belief in the importance of biomechanics; the centrality of manual therapy, especially for the spine; and a clinical dynamic that provides patients with explanations, meaning, and concrete experiences that promote a strong patient-physician bond, a sense of caring, and a restored sense of well-being.

CHIROPRACTIC'S ORIGIN

Most sources date the birth of chiropractic as September 18, 1895, when Daniel David (usually called "D. D.") Palmer (1845-1913) shoved a single cervical vertebra of a deaf janitor of the Putnam Building in downtown Davenport, Iowa. A mythic aura clings to the event, partly because of its importance and because there is little agreement among witnesses about when it happened, who was there, or what actually occurred.¹⁰ (The mythic aspect of the story may have been intentionally enhanced by selecting the date of Rosh Hashanah, the Jewish New Year, which was an occasion for revelation in 19th-century American millennialism.^{11,12}) Whether fact, folklore, or both, the founding blow of chiropractic was more than a chance event or momentary inspiration. In fact, it creatively synthesized 4 previously distinct health care traditions: bonesetting, magnetic healing, orthodox science, and popular health reform.

Bonesetters

Bonesetters were a common fixture in 19th-century health care. As with the other healing crafts—midwifery, tooth-pulling, and barber-surgery—bonesetting was often part-time work and served clients who had problems that were regarded by academically trained physicians as

inconsequential or beneath their dignity.^{13,14} Bonesetters did much more than help mend bones. They often treated painful conditions caused by "subluxations," which meant a "joint 'put out'; and the one method of cure [is] the wrench aid, the rough movement by which it is said that the joint is 'put in' again."^{15(p1)}

Palmer frequently mentioned the bonesetter's tradition, identified with it, and probably had some training in it. Palmer's innovation professionalized the craft, guaranteeing its continuation into the modern era. The upgrade extended to nomenclature; with help from a minister conversant with Greek, "bonesetting" became "chiropractic," a phrase that means "hand work."

Magnetic Healing

Although the bonesetting tradition gave chiropractic its method, "magnetic healing" provided the theory. Palmer acknowledged a special debt to magnetic healing when he wrote, "chiropractic was not evolved from medicine or any other method, except that of magnetic."^{16(p111)} Derived from Anton Mesmer's (1734-1815) investigations into the supposed curative effects of animal magnetism, practitioners of magnetic healing identified the unimpeded flow of energy with health and defined illness as obstruction. For 9 years before his discovery of chiropractic, Palmer was one of a small army of healers who routinely "magnetized" their patients.¹⁷ Palmer's major revision of traditional magnetism was to call it "innate intelligence" and to claim that its pathway was the human nervous system, especially the spinal cord. Misaligned spinal vertebrae (the redefined bonesetters' "subluxation") impinge on this beneficent flow and cause illness. By marrying magnetism to bonesetting, Palmer created a new and independent medical movement, one more capable of competing for legitimacy than either of its predecessors had been.

Orthodox Science

Neither bonesetting nor magnetic healing could be persuasively described as science. The former was

clearly a folk tradition, and the latter could not shed its occult status. Chiropractic, however, could and did describe itself as science, and in the 19th century, such a label was indispensable if a medical movement hoped to emerge from a host of contending traditions. Although self-taught, Palmer saw himself as a scientist and wasted no time in adopting prevailing scientific notions of the spinal cord to chiropractic theory. An early 19th-century fascination with the spinal cord led to mainstream speculation, and by 1828, orthodox physicians began to warn about the threat posed to the organs of the body by "spinal irritation."¹⁸ Spinal irritation in the 19th century became a catchall for a host of complaints. The theory was so well accepted that Oliver Wendell Holmes (1809-1894) could comfortably tell the 1871 graduating class of Bellevue Hospital College that he kept the phrase "spinal irritation" "on hand for patients that [sic] will insist on knowing the pathology of their complaints."^{19(p389)} Gradually discarded by mainstream medicine and replaced by the term "neurasthenia" (and later, "depression"), spinal irritation entered into chiropractic through the subluxation terminology of bonesetters. Palmer extended the scope of spinal irritation and subluxation beyond the class of ailments that otherwise defied analysis; it was, for him, the key to understanding sickness as a whole. At the same time, the adoption of the widely accepted concept of spinal irritation lent credibility to chiropractic.

Popular Health Reform

Palmer cured the Davenport janitor of his deafness. This restoration of hearing might have been regarded as a freak occurrence were it not for a medical environment in which news of such occurrences was eagerly awaited. A well-publicized tug-of-war between "regulars" (physicians) and "irregulars" (alternative medicine practitioners) already had been sweeping the country.²⁰ The introduction of homeopathy, herbal medicine, "Mind Cure," Christian Science, health food, and hydropathy had pre-

pared Americans to look for cases that, on the one hand, pointed to the limitations of mainstream medicine and, on the other, made the miraculous seem obtainable.²¹ The way to perfect health was on the horizon, waiting to be grasped, described, and disseminated.

The unique union of bonesetting, magnetism, and orthodoxy was warmly received. The conflict for medical hegemony both helped and was helped by chiropractic. Palmer's invectives against the establishment of "germo-anti-toxis-vaxi-radi-electro-microbio-slush death producers"²² resonated with the movement, as did his grandiose promises of a medicine "destined to be the grandest and greatest of this or any age"^{16(p224)} because it was successful in all forms of disease. Chiropractic was the glamorous new recruit in the old war with mainstream medicine. Conventional medicine recognized the threat (see below) and had its own rhetoric ready. For example, in 1925, Morris Fishbein (1889-1976), editor of *The Journal of the American Medical Association*, wrote that chiropractors arrived on the health care scene "through the cellar . . . besmirched with dust and grime."^{23(p98)}

DISSENSION WITHIN THE MOVEMENT

Palmer may have articulated a medical system with a single bold stroke, but neither he nor his son and successor, Bartlett Joshua Palmer (usually called "B. J.," 1882-1961), despite their best efforts, could keep it from beginning to unravel shortly thereafter.

Against the Notion of "Innate Intelligence"

Palmer's notion of innate intelligence (see the subsection on "Magnetic Healing" under "Chiropractic's Origin") was in dispute from the beginning. Many of his first disciples, destined themselves to be influential teachers of chiropractic, never adopted it. The list of those who reject the innate as "religious baggage" reads like an honor roll of chiropractic's history.²⁴ Willard Carver (1866-1940), who founded a core group of chiropractic teaching

institutions, thought a physiological theory of nerves was sufficient.²⁵ John A. Howard (1876-1953), who came to chiropractic from a conventional medical background and, in 1906, founded what became the National College of Chiropractic, was thinking of innate intelligence when he warned students not to "dwindle or dwarf chiropractic by making a religion out of a technic."^{26(p17)} The first chair of what became the Council for Chiropractic Accreditation, Claude O. Watkins (1909-1977), called for scientific research and the abandonment of all cultist and vitalist principles, starting with that of the innate.²⁷

Today, a substantial number of chiropractors are anxious to sever all remaining ties to the vitalism of innate intelligence. For these practitioners, the notion of the innate serves only to maintain chiropractic as a fringe profession²⁸ and to delay its "transition into legitimate professional education, with serious scholarship, research, and service."^{29(p41)}

Against the Notion of Subluxation

Palmer's followers were also quick to amend the notion of subluxation. For Palmer, the term referred to the static misalignment of a single vertebra. In the earliest chiropractic text ever published (*Modernized Chiropractic*, 1906), the meaning of subluxation was expanded to include issues of joint mobility.³⁰ In the late 1930s, these ideas were extended further, making spinal fixation, or restricted movement, the focus of chiropractic manipulation.³¹ Some early chiropractors considered curvature of the spine and posture defects caused by muscular imbalance to be crucial and bone involvement secondary,²³ while others thought that subluxation arose from fatigue or tension in the back muscle.³² Another group³³ maintained that subluxations were disturbances in the nerves themselves or in the muscles surrounding them, rather than defects in the bones.

Support for the original notion of subluxation was also reduced by continuous biomedical criticism that points away from, and finally discounts, bone alignment as the cause of back pain.³⁴ The criti-

cism of an anatomist³⁵ who concluded after a series of experiments that it is nearly impossible for vertebral displacement to impinge on a spinal nerve at the intervertebral foramen has also weakened allegiance to the concept.

Many chiropractors no longer refer to simple subluxation but to a "vertebral subluxation complex," with an expanded meaning of mechanical impediments beyond bone displacement that can include mobility, posture, blood flow, muscle tone, and the condition of the nerves themselves.³⁶ Some want to abandon the term altogether because it "threatens to strangle the discipline."³⁷ Others speak of manipulable spinal lesions,³⁸ chiropractic lesions,³⁹ or vertebral blockage.⁴⁰ For D. D. Palmer, the meaning of subluxation was clear and unambiguous; today, it refers to an assortment of disturbances. Subluxation is defined less in theory than in practice: subluxation is what a chiropractor corrects. What Palmer initiated with a single thrust has evolved into an array of meanings.

The "Straight-Mixer" Schism

Serious as disagreement over the innate and subluxation was for chiropractic, it is overshadowed by the struggle for self-definition. For the Palmers, mastery over the spine meant mastery over nearly all disease. They believed that chiropractic was not the best response; it was the only response. When other practitioners suggested that they might be guilty of narrow-mindedness, B. J. Palmer denounced them as "chiropractoids" who had adulterated the "specific, pure, and unadulterated" chiropractic tradition, opening the way to "mixers."^{41(p49)} B. J. Palmer's labeling of "straight" practitioners at war with "mixers" is still used today to describe an unresolved schism.

"Straights" tend to rely exclusively on spinal adjustments, to emphasize innate intelligence, and to subscribe to the notion that subluxation "is the leading cause of disease in the world today."^{42(p25)} Since the 1930s, straights have been a very distinct minority in the profession.⁴³ Nonetheless, they have been

able to transform their status as purists and heirs of the lineage into influence dramatically out of proportion to their numbers.⁴⁴

"Mixers" tend to be more open to conventional medicine and to mainstream scientific tenets. For today's majority mixers, subluxation is one of many causes of disease.⁴⁵ This translates into a greater use of therapies other than spinal manipulation. The National Board of Chiropractic Examiners⁴⁶ indicates that most chiropractors use conventional physical therapy techniques, such as corrective exercise, ice packs, bracing, bed rest, moist heat, and massage. Nutritional supplements are the next leading nonmanipulative therapy in mixer practice, and depending on state laws, some chiropractors provide acupuncture, homeopathy, herbal remedies, and even biofeedback.⁴⁷

Paradoxically, mixers, despite their wide range of therapeutics, tend to have a narrower and more modest claim for chiropractic's scope of practice. Also, some mixers see themselves less as traditional chiropractors and more as practitioners of a generic complementary medicine.⁴⁸ A second, larger group of mixers seeks to situate themselves in the broader mainstream health care system as specialists in musculoskeletal disorders.⁴⁹

SPINAL MANIPULATION: THE CORE CHIROPRACTIC ACT

Adjusting with the hands—the signature chiropractic gesture—is the unifying activity that allows chiropractic to transcend its internal discord and create a coherent profession. Overriding disputes within the profession, the core question for all chiropractors remains unchanged and agreed on: how should the hands move the vertebrae? Beneath doctrinal disparity and clinical diversity, chiropractic has an internal cohesion that is more than a defensive reaction to a critical world. Chiropractors believe that the correction of spinal abnormality—the adjustment of vertebrae—is a critical healing act.

Obviously, vertebrae move all the time. The physical activities of daily life—exercise, turning, twist-

ing, bending—require a normal range of motion. Greater mobility, or "mobilization," can be coaxed from the joints with the assistance of a physical therapist, for example, who can stretch the lower spine by gently moving the thigh of a person lying on his or her side. Eventually, mobilization reaches an elastic barrier of resistance, known to chiropractors as "end feel."

Chiropractic manipulation is a method of moving vertebrae beyond end feel, but not so far as to destroy the integrity of joint structure. The adjustment temporarily creates an increased range of motion. The patient feels the change and often hears a popping or cracking noise, which some attribute to a sudden liberation of synovial gases.⁵⁰

The vertebrae can be moved by direct contact—the "short-lever" technique—or through a distant linkage, or the "long-lever" method. The latter method is used, for example, when a dynamic thrust of the thigh moves a vertebra in the lower spine. "Amplitude" refers to the depth or distance traveled by a practitioner's thrust. When joints are less accessible or when a long lever is involved, the amplitude increases. The degree of force applied is yet another variable.

Emblematic Chiropractic Adjustment

Palmer claimed to have discovered the use of spinous and transverse processes of the spine as levers and to be the first to use direct contact with a vertebra that was "out."^{16(p19)} B. J. Palmer developed the "recoil adjustment," in which a practitioner quickly pushes the vertebra into motion and then, instead of maintaining pressure, relies on a fast release to generate a type of rebound. B. J. Palmer thought this maneuver allowed the body's innate intelligence to set a vertebra in its exact place. With or without recoil adjustment, the short-lever technique—touching the vertebra directly at high velocity and low amplitude, that is, by moving a small distance—with the spinal or transverse process as a fulcrum is considered the typical chiropractic maneuver.

Diversity in Manipulation

Chiropractors besides the Palmers were quick to make their own contributions, and the profession soon encompassed diverse styles, which often occasioned fresh disputes.⁵¹ Whereas the Palmers emphasized one vertebra at a time, Carver developed methods to adjust the lumbar spine as a unit. Practitioners such as Oakley Smith and Solon Langworthy borrowed long-lever osteopathic techniques and folk methods such as Bohemian (Czech) manipulation. "Diversified technique" is the label for the largest and most eclectic collection of different methods many chiropractors use.⁵²

Besides the forceful techniques, gentler methods of manipulation are common in chiropractic. The sacro-occipital technique, developed by DeJarnette in the 1930s,⁵³ relies on the passive weight of a patient pressing down on strategically placed padded wedges to reposition the pelvis and spine. The Logan basic technique⁵⁴ applies light thumb pressure close to the sacrotuberous ligament to move the sacrum. The activator technique⁵⁵ makes use of a small spring-loaded instrument that looks like a small plunger with a hard sponge on the tip to deliver pressure to the vertebrae. Some practitioners use tables with segmental drop pieces to allow low-force, high-velocity adjustment.⁵⁶ In total, observers of the profession have counted between 96⁵⁷ and more than 200⁵⁸ specifically chiropractic-type maneuvers. Most chiropractors draw on a variety of maneuvers on the basis of education and personal affinity, and most develop their own distinctive style.⁵⁹

CHIROPRACTIC BATTLE FOR ACCEPTANCE

Chiropractic's cohesiveness has been forged in its battle for licensing. Chiropractors fought zealously for their current legal and professional status, suspending doctrinal wars when questions of state licensing were at stake.⁶⁰ The opposition was usually organized medicine.

From the beginning, chiropractors understood that the decisive factor for success was professional self-

regulation, which would mean protection from uninformed and possibly adverse supervision and the bolstering of public confidence in the modality. State recognition was first achieved in Kansas in 1913; Louisiana granted recognition in 1974. The 60 years in between testify to the vehemence with which conventional medicine resisted.

Hostility on the part of conventional medicine usually backfired. The struggle in California serves as a case in point. Tullius Ratledge (1881-1967) led a fledgling movement to license chiropractic in the state.⁶¹ In 1916, he was sentenced to 90 days in jail for practicing medicine without a license. As with most chiropractic arrests, the charge arose not from patient complaints but from medically instigated entrapment. Chiropractors were charged with violating the medical practice act and the controversy generated publicity on a scale the licensing attempt had never enjoyed before. California chiropractors adopted the slogan, "Go to jail for chiropractic." At the height of the controversy, 450 chiropractors were jailed in a single year.⁶² Undeterred, many set up portable tables to treat fellow prisoners and visiting patients. Chiropractors forgot whether a colleague believed in the innate or subluxations or was a mixer or straight. By the time a woman chiropractor collapsed after a 10-day hunger strike in jail, public sympathy had swung to the side of chiropractic's courageous practitioners, and the medical lobby had been routed. In 1922, in a state referendum, Californians voted by an overwhelming majority to license the profession, and all chiropractors still in jail were pardoned on grounds that they had been unjustly accused.¹⁰ Each state had its version of this battle; chiropractic emerged the winner every time.

Federal acceptance was later in coming, beginning in the 1970s when state licensing was already universal. Federal recognition consolidated state acceptance by providing coverage for chiropractic under Medicaid, Medicare, and Worker's Compensation; accepting the Council of Chiropractic Education as the official accrediting agency of chiropractic colleges; granting sick leave based on chiropractic certification

for federal civil service employees; allowing federal income deductions for chiropractic care; and finally, allocating federal research money through the National Institutes of Health for chiropractic research.⁴⁵

The final victory came with what chiropractors refer to as the "trial of the century," which again pitted them against the medical establishment. From its inception in 1847, the AMA had a clause that prohibited members from consulting with practitioners "whose practice is based on an exclusive dogma."^{63(p171)} In 1957, in reaction to gains made by chiropractic, the AMA explicitly interpreted this clause to forbid consultations with chiropractors, and in 1963, the AMA's Committee on Quackery was formed primarily "to contain and eliminate chiropractic."^{64(p292)}

In 1976, 5 chiropractors brought a suit against the AMA and allied conventional medical organizations. In 1987, after long and costly litigation, the US District Court in Illinois found the AMA and many of its associates, including the American College of Radiology and the American College of Surgeons, guilty of conspiracy against chiropractors and in violation of the federal anti-trust laws. The permanent injunction issued against the AMA required *The Journal of the American Medical Association* to publish the court's judgment.⁶⁵ In 1990, the US Supreme Court let this decision stand without comment. The AMA, chiropractic's historic enemy, had been forced to cease and desist.

CHIROPRACTIC HEALTH CARE

Chiropractic health care is based on the endemic presence of pain, especially low back pain, in the United States. Between 70% and 80% of all adults experience low back pain at some time in their lives,⁶⁶ and in any one year, more than 50% of Americans suffer from the telltale nagging-tugging sensation.⁶⁷ So pervasive is back pain in this society that, as one authority has mused,⁶⁸ it might be abnormal not to suffer from it. Chronic pain is no less a problem, and data⁶⁹ suggest that nearly a third

of the American population suffers from some sort of chronic pain.

It is no secret that low back pain and chronic pain are the Achilles' heel of biomedicine and present a need and opportunity for alternative responses. By far the largest percentage of patients—at least 80%—go to chiropractors for neuromusculoskeletal and musculoskeletal problems.⁷⁰ Of these patients, at least 65% have back pain; most other symptoms involve the neck, extremities, and head.⁷¹

PATIENT PERCEPTIONS

Many large and methodologically sound surveys from diverse sampling populations leave little doubt that patients believe chiropractic works for them. The results show that most chiropractic patients and former patients are likely to be satisfied with the treatment they received.⁷²⁻⁷⁵ Studies that compare patients' satisfaction with chiropractic with that of conventional medicine in treating low back pain demonstrate marked preference for chiropractic. A 1986 survey of members of a Washington State health maintenance organization that offers both conventional and chiropractic care compared the responses of 359 patients treated by conventional physicians with those of 348 patients treated by chiropractors. Patients treated by chiropractors for low back pain were 3 times as likely—66% to 22%—to report that they were "very satisfied" with the care they had received.⁷⁶ A Utah study (1973) reported comparable results.⁷⁷ Patients perceive chiropractic as a valuable component of their health care.

SCIENTIFIC EVIDENCE FOR SPINAL MANIPULATION

Obviously, unimpeachable testimonials are not sufficient evidence of effectiveness or efficacy. Science demands controlled studies to establish legitimacy, and although the methodological problems for studying low back pain are notorious,⁷⁸ especially for nonpharmacological interventions,⁷⁹ such studies are the only basis for evaluating spinal manipulation. Fortunately, about 40 randomized controlled trials (RCTs), predominantly for low back pain, ex-

ist for spinal manipulation. Unfortunately, a substantial number of these RCTs actually concern forms of spinal manipulation that may not correspond to chiropractic treatment (eg, osteopathic manipulation, British Cyriax treatment, Australian Maitland methods, and Dutch manual therapy). Despite this additional weakness, these RCTs are the basis with which to evaluate the efficacy of spinal manipulation and, it is hoped, of chiropractic. The scientific investigation of clinical manipulation has taken 4 forms: sham-controlled RCTs, equivalency RCTs comparing manipulation with conventional treatments, systematic evaluations in the form of meta-analysis, and large-scale pragmatic RCTs.

Sham-Controlled RCTs for Low Back Pain

Since 1974, at least 11 single-blind RCTs with at least 1 arm being a sham control have been performed for spinal manipulation for low back pain. Four trials⁸⁰⁻⁸³ show no difference with manipulation and sham; 3 trials⁸⁴⁻⁸⁶ clearly show a benefit; and 3 trials⁸⁷⁻⁸⁹ allow for the possibility of some value for manipulation, depending on what is considered the outcome, the duration of the outcome, and how outcome measures are aggregated. The methodological quality of these trials, with few exceptions, is weak (eg, high dropout rates, insufficient numbers, generalizability of treatment procedures, and outcome measures with uncertain relationships to expected changes), thus making conclusions problematic. Advocates argue that the practitioners were not properly trained and too little treatment was given, and detractors argue that there was insufficient blinding and that at least 1 of the interventions used more than manipulation.⁸⁵

Equivalency or Comparative RCTs for Low Back Pain

At least 15 equivalency trials⁹⁰⁻¹⁰⁴ for low back pain have been done in which 1 group of patients received manipulation and at least 1 other group received conventional treat-

ment. These trials make a better case for spinal manipulation. Nine trials⁹⁰⁻⁹⁸ show significant benefits, 4 trials⁹⁹⁻¹⁰² indicate no difference, 1 trial¹⁰³ is difficult to interpret, and 1¹⁰⁴ shows improvement in only a subgroup in the post hoc analysis. Again, problems abound. For example, which outcome and what exact time were prospectively viewed as the decisive measure are sometimes unclear. Also, a large 4-arm trial (manipulation vs physical therapy vs general practitioner vs placebo ultrasound or diathermy) is difficult to characterize because it combined patients with low back pain with those with neck pain and had both equivalency and sham comparisons. The results are nonetheless interesting: manipulation and physical therapy were significantly more beneficial than the general practitioner but did not reach statistical significance when compared with the sham trial. General practitioners' results were significantly worse than those in the sham comparisons.¹⁰⁵

Equivalency trials can have problems. They often do not control for unequal belief and credibility and the comparability of physician-patient contact time, and it is sometimes questionable whether the conventional therapies in the comparison group have been adequately tested. Nonetheless, this evidence can be considered impressive. Most comparison trials show manipulation to be better, and no trial finds it to be significantly worse, than conventional treatments. As 1 researcher-scholar^{44(p368)} put it, "more orthodox therapy, such as standard physical medicine or analgesics, despite being more 'scientific,' is not better."

Meta-analytic Reviews for Low Back Pain

Meta-analytic attempts to objectively summarize most of the above-mentioned spinal manipulation trials for low back pain and create a larger, more statistically valid pool of subjects on which to draw conclusions have been important in the scientific discussion of spinal manipulation. The most widely reported meta-analytic study of RCTs

of manipulation for low back pain concluded that

[S]pinal manipulation is of short-term benefit in some patients, particularly those with uncomplicated, acute low-back pain. Data are insufficient concerning the efficacy of spinal manipulation for chronic low-back pain.^{106(p590)}

Another meta-analysis¹⁰⁷ reported similar findings. Still another systematic review that studied only the 5 trials that were clearly chiropractic manipulation (as opposed to other or imprecise forms of manual therapy) and did not mathematically aggregate the outcomes reported that^{108(p487)}:

[A]lthough the small numbers of chiropractic RCTs and the poor general methodological quality precludes [sic] the drawing of strong conclusions, chiropractic seems to be an effective treatment of back pain. However, more studies with a better research methodology are clearly still needed.

Pragmatic RCTs for Low Back Pain

Pragmatic RCTs compare 2 treatments under conditions in which they would be applied normally or optimally. Practitioners and patients are not blinded, and these trials generally do not control for a wide range of "nonspecific" effects. The goal is clinical decision. By far the largest and most sophisticated such pragmatic experiment took place in the United Kingdom. A total of 741 men and women with chronic low back pain at 11 matched pairs of chiropractic clinics and hospital outpatient departments were randomly assigned to either chiropractic or conventional care. The results demonstrated that

chiropractic almost certainly confers worthwhile, long term benefit in comparison with hospital outpatient management. The benefit is seen mainly in those with chronic or severe pain.^{109(p1431)}

The 3-year follow-up confirmed these findings.¹¹⁰ Curiously, this study contradicts the preponderance of other RCTs in which the advantages of manipulation were more pronounced for acute pain. (Extrapolating these results to the United States is difficult because the biomedical manage-

ment of low back pain in these 2 countries is radically different.)

As mentioned earlier, on the basis of these RCTs and meta-analyses, the Agency for Health Care Policy and Research in December 1994 stated^{5(p34)} with guarded optimism that

[M]anipulation 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 efficacy is unproven.

Scientific Evidence for the Benefits of Chiropractic for Neck Pain and Headache

After low back pain, neck pain and headache constitute the largest such research category, comprising at least 10 trials. Of 6 trials of neck pain,¹¹¹⁻¹¹⁶ 2 sham trials^{111,112} show benefits with manipulation; 2 equivalency trials^{113,114} show manipulation to be superior to conventional therapy; and in the 2 comparison trials in which manipulation is additive to conventional treatment in 1 arm, 1 trial¹¹⁵ shows benefits of manipulation, and 1¹¹⁶ shows no difference in treatment results. Whereas in a recent meta-analysis, it was believed that conclusions "must be made cautiously because of the small number of trials," it could still report that "there is early evidence to support the use of manual treatments in combination with other treatments for short term [neck] pain relief."^{117(p1296)} Another recent meta-analysis¹¹⁸ of cervical manipulation had a similar outcome. Of the headache trials, the single sham control trial¹¹⁹ for migraine shows a benefit with manipulation, 2 equivalency trials^{120,121} (1 for post-traumatic headache and 1 for tension headache) show a benefit with manipulation, and a third¹²² (muscle-contraction headache) is difficult to interpret. Again, the systematic review hesitantly concluded that the manipulation "may be beneficial for muscle tension headaches."^{118(p1755)}

Scientific Evidence for the Benefits of Manipulation for Other Conditions

The evidence for chiropractic's competence for conditions beyond pain

is scarce. A few such RCTs exist and include menstrual pain,^{123,124} hypertension,^{125,126} and chronic obstructive lung disease.¹²⁷ Drawing any conclusions, besides that there is a need for research, is premature. This uneven balance of broad claims and scarce science is undoubtedly a source of friction between the profession and the biomedical community.

Adverse Effects of Chiropractic

The scientific value of manipulation needs to be viewed in the context of possible adverse effects. Of 138 cases of serious complications due to chiropractic, a recent review¹²⁸ found more than 8 of 10 were from cervical manipulation. Serious adverse incidences from neck rotation have included vertebral basilar accidents with consequences such as brainstem or cerebellar infarction (or both), Wallenberg syndrome, locked-in syndrome, and such problems as spinal cord compression, vertebral fracture, tracheal rupture, diaphragm paralysis, and internal carotid hematoma.^{118,129-131} Although the rate of serious complications is still debatable (because the exact denominator and numerator are unknown), estimates vary from 1 in 400 000¹³² to between 3 and 6 per 10 million.¹¹⁸ Some researchers¹³³ have advocated an informed consent procedure before patients receive cervical manipulation with thrust techniques, and others^{118,134} have noted that appropriate examination procedures and specific styles of manipulation may reduce the incidence of complications. The potential for complications with lumbar spine manipulation seems less serious. The chief concern is cauda equina syndrome, and the estimated rate of occurrence has been between "one in many millions of treatments"¹³⁵ to less than 1 per 100 million manipulations.¹⁰⁶

THE ART OF MEDICINE AND CHIROPRACTIC'S EFFECTIVENESS

It could be argued that additional evidence for chiropractic's effectiveness is still required for it to establish its scientific merits, especially for

use beyond treating low back pain. Regardless of what future research will demonstrate, chiropractic will undoubtedly be an important and prominent feature of US health care. Part of its strength may lie in the domain of the art of healing and how the chiropractic profession negotiates the patient-physician relationship.

For people with chronic pain or with other refractory conditions, the chiropractic visit itself can be a source of comfort even without the addition of a demonstrable scientific component. Treatment by a chiropractor can generate a sense of understanding and meaning, an experience of comfort, an expectation of change, and a feeling of empowerment.¹³⁶ Chiropractic's combination of vitalist "innate intelligence" and simple mechanical explanation can give rich vocabulary for just those illnesses conventional medicine remains poorly equipped to address. Research indicates that for many of the illnesses chiropractic treats, precise diagnosis, assurance of recovery, and physician-patient agreement about the nature of a problem hasten recovery.^{137,138}

Chiropractic finds its voice exactly where biomedicine becomes inarticulate. Too often, biomedicine fails to affirm a patient's chronic pain. Patients think their experience is brushed aside by a physician who treats it as unjustified, unfounded, or annoying, attitudes that heighten a patient's anguish and intensify suffering.¹³⁹ Chiropractors never have to put a patient's pain in the category of the "mind." They never fail to find a problem. By rooting pain in a clear physical cause, chiropractic validates the patient's experience. Even for patients with acute pain, chiropractic's assertiveness, clarity, and precision provide reassurances. As an anthropologist^{140(p83)} has noted:

[T]he chiropractor provides the patient with a structured, supportive environment and theoretical explanations designed to take the mystery out of process and problems. In essence, the chiropractor first manipulates a patient's belief structure before manipulating his or her physical structure.

Chiropractic is in no sense passive; it is, from the start, engaged. Except when contraindicated (as in pa-

tients with neoplastic disease and those with extreme osteoporosis), some form of therapy is almost always indicated. For most symptoms, there is a suitable manipulation or a designated mode of redress.

Chiropractic adjustment evokes an experience of change so palpable that the patient can often hear it in the characteristic "pop" or "crack," indicating that normal range of motion has been exceeded and a state of greater mobility and ease, however temporary, has been achieved. A perception of transformation has been audibly triggered. The chiropractic approach to healing relies on the opposite of double-blindedness; it enlists the full participation and awareness of both parties.

From the first encounter on, chiropractors generate different expectations from conventional physicians. Because conventional practitioners assume that back pain, in the absence of systemic signs, is likely to be self-limited, it is not unusual for a patient to wait weeks for an appointment with a specialist or for a radiographic diagnostic assessment. Because a chiropractor believes that back pain is both explicable and amenable to treatment, a patient can usually obtain an appointment within 24 hours of a telephone call. The message of empathy, urgency, comprehension, and support conveyed by such a rapid response is reassuring and provides a heightened sense of care and compassion.

CONCLUSIONS

Chiropractic has endured, grown, and thrived in the United States, despite internal contentiousness and external opposition. Its persistence suggests it will continue to endure as an important component of health care in the United States. In response to the countless requests for the treatment of pain, chiropractors have consistently offered the promise, assurance, and perception of relief. Chiropractic's ultimate lesson may be to reinforce the principle that the patient-physician relationship is fundamentally about words and deeds of connection and compassion. Chiropractic has managed to embody this message in the gift of the hands.

Accepted for publication August 6, 1998.

This study was supported in part by grant U24 AR43441 from the National Institutes of Health, Bethesda, Md; the John E. Fetzer Institute, Kalamazoo, Mich; the Waletzky Charitable Trust, Washington, DC; the Friends of the Beth Israel Hospital, Boston, Mass; the J. E. and Z. B. Butler Foundation, New York, NY; and the Kenneth J. Germeshausen Foundation, Boston, Mass.

We thank Harvey Blume, Janet Walzer, MEd, Debora Lane, and Marcia Rich for editorial assistance and Robb Scholten, Linda Barnes, PhD, Maria Van Rompay, and Anthony Rosner, PhD, for research assistance.

Reprints: Ted J. Kaptchuk, OMD, Center for Alternative Medicine Research, Beth Israel Deaconess Medical Center, Harvard Medical School, 330 Brookline Ave, Boston, MA 02215.

REFERENCES

- Deyo RA, Tsui-Wu YJ. Descriptive epidemiology of low-back pain and its related medical care in the United States. *Spine*. 1987;12:264-268.
- Shekelle PG. *The Use and Costs of Chiropractic Care in the Health Insurance Experiment*. Santa Monica, Calif: RAND/Agency for Health Care Policy and Research; 1994. Publication MR-401-CCR.
- Stano M. The chiropractic services market: a literature review. In: Scheffler R, Rossiter L, eds. *Advances in Health Economics and Health Services Research*. Greenwich, Conn: JAI Press; 1992;13:191-204.
- DeLozier JE, Gagnon RO. *National Ambulatory Medical Care Survey: 1989 Summary*. Hyattsville, Md: National Center for Health Statistics; 1991. Advance Data From Vital and Health Statistics, No. 203.
- Bigos S, Bowyer O, Braen B, et al. *Clinical Practice Guideline No. 14: Acute Low Back Problems in Adults*. Rockville, Md: US Dept of Health and Human Services, Agency for Health Care Policy and Research; 1994. AHCPR publication 95-0642.
- Cooper RA, Stoflet SJ. Trends in the education and practice of alternative medicine clinicians. *Health Aff (Millwood)*. 1996;15:226-238.
- Plamondon RL. Hospital privileges survey. *Am Chiropract Assoc J Chiropract*. 1993;10:32-35.
- Mootz RD, Meeker WC, Hawk C. Chiropractic in the health care system. In: Group Health Cooperative of Puget Sound, Seattle, Wash, Center for Health Studies, eds. *Chiropractic in the United States: Training, Practice, and Research*. Rockville, Md: US Dept of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research; 1997:49-65.
- Pelletier KR, Marie A, Krasner M, Haskell WL. Current trends in the integration and reimbursement of complementary and alternative medicine by managed care, insurance carriers, and hospital providers. *Am J Health Promot*. 1997;12:112-122.
- Wardwell WI. *Chiropractic: History and Evolution of a New Profession*. St Louis, Mo: Mosby-Year Book; 1992.
- Doan RA. *The Miller Heresy, Millennialism, and American Culture*. Philadelphia, Pa: Temple University Press; 1987.
- Arasola K. *The End of Historicism: Millerite Hermeneutic of Time Prophecies in the Old Testament*. Uppsala, Sweden: Faculty of Theology, University of Uppsala; 1989.
- Cooter R. Bones of contention? orthodox medicine and the mystery of the bone-setter's craft. In: Bynum WF, Porter R, eds. *Medical Fringe and Medical Orthodoxy, 1750-1850*. London, England: Croom Helm; 1987:158-173.
- LeVay D. British bone-setters. *Hist Med Q*. 1971;3:13-15.
- Page J. Cases that bonesetters cure. *BMJ*. 1867;1:1-4.
- Palmer DD. *Textbook of the Science, Art and Philosophy of Chiropractic*. Portland, Ore: Portland Printing; 1910.
- Fuller RC. *Mesmerism and the American Cure of Souls*. Philadelphia: University of Pennsylvania Press; 1982.
- Shorter E. *From Paralysis to Fatigue: A History of Psychosomatic Illness in the Modern Era*. New York, NY: Free Press; 1992.
- Holmes OW. The young practitioner. In: *Medical Essays*. Boston, Mass: Houghton Mifflin Co; 1883:370-395.
- Whorton JC. The first holistic revolution: alternative medicine in the nineteenth century. In: Stalker D, Glymour C, eds. *Examining Holistic Medicine*. Buffalo, NY: Prometheus; 1989:29-48.
- Gevitz N, ed. *Other Healers: Unorthodox Medicine in America*. Baltimore, Md: Johns Hopkins University Press; 1988.
- Palmer DD, Palmer BJ. *The Science of Chiropractic: Its Principles and Adjustments*. Davenport, Iowa: The Palmer School of Chiropractic; 1906:10.
- Fishbein M. *The Medical Follies*. New York, NY: Boni & Liveright; 1925.
- Waagen G, Strang V. Origin and development of traditional chiropractic philosophy. In: Haldeman S, ed. *Principles and Practice of Chiropractic*. Norwalk, Conn: Appleton & Lange; 1992:29-43.
- Jackson RB, Willard Carver, LL.B, D.C. 1866-1943: doctor, lawyer, Indian chief, prisoner and more. *Chiropract Hist*. 1994;14:13-24.
- Beideman RP. Seeking the rational alternative: the National College of Chiropractic from 1906 to 1982. *Chiropract Hist*. 1983;3:17-22.
- Keating J, Claude O, Watkins: pioneer advocate for clinical scientific chiropractic. *Chiropract Hist*. 1987;7:11-15.
- Winterstein JF. Is traditional "chiropractic philosophy" valid today? *Philos Constructs Chiropract Profession*. 1991;1:37-40.
- DeBoer KF. Commentary: *eine kleine nacht* musing. *Am J Chiropract Med*. 1988;1:41.
- Faye LJ, Wiles MR. Manual examination of the spine. In: Haldeman S, ed. *Principles and Practice of Chiropractic*. Norwalk, Conn: Appleton & Lange; 1992:301-318.
- Gillet H. The history of motion palpation. *Eur J Chiropract*. 1983;31:196-201.
- Heese N. Major Bernard De Jarnette: six decades of sacro occipital research, 1924-1984. *Chiropract Hist*. 1991;11:13-21.
- Homewood AE. *The Neurodynamics of the Vertebral Subluxation*. Thornhill, Ontario: Chiropractic Publishers; 1973.
- Goldstein M. Introduction, summary and analysis. In: *The Research Status of Spinal Manipulative Therapy*. Bethesda, Md: US Dept of Health, Education, and Welfare, Public Health Service, National Institutes of Health, National Institute of Neurological and Communicative Disorders and Stroke; 1975:3-7. Publication NIH 76-998.
- Crelin ES. A scientific test of the chiropractic theory. *Am Scientist*. 1973;61:574-580.
- Lantz CA. The vertebral subluxation complex, I: introduction to the model and the kinesiological component. *Chiropract Res J*. 1989;13:23-26.
- Keating JC Jr. Science and politics and the subluxation. *Am J Chiropract Med*. 1988;113:109-110.
- Haldeman S. Spinal manipulation therapy: a status report. *Clin Orthop*. 1983;179:62-70.

39. Keating JC Jr. Shades of straight: diversity among the purists. *J Manipulative Physiol Ther.* 1992; 15:203-209.
40. Lewit K. *Manipulative Therapy and Rehabilitation of the Locomotor System.* Woburn, Mass: Butterworth-Heinemann; 1985.
41. Moore JS. *Chiropractic in America: the History of a Medical Alternative.* Baltimore, Md: Johns Hopkins University Press; 1993:42-72.
42. Hammett RJ. Perfect practice parameters: part II. *Am J Clin Chiropract.* 1993;3:3.
43. Martin SC. Chiropractic and the social context of medical technology, 1895-1925. *Technol Cult.* 1993;34:808-834.
44. Coulehan JL. Adjustment, the hands and healing. *Cult Med Psychiatry.* 1985;9:353-382.
45. Baer HA. Divergence and convergence in two systems of manual medicine: osteopathy and chiropractic in the United States. *Med Anthropol Q.* 1987;1:176-193.
46. National Board of Chiropractic Examiners. *Job Analysis of Chiropractic.* Greeley, Colo: National Board of Chiropractic Examiners; 1993.
47. Lamm LC, Wegner E, Collard D. Chiropractic scope of practice: what the law allows—update. *J Manipulative Physiol Ther.* 1993;18: 16-20.
48. Jamison JR. Holistic health care in primary practice: chiropractic contributing to a sustainable health care system. *J Manipulative Physiol Ther.* 1992;15:604-608.
49. Cassata DM. Chiropractic clinical purpose: primary care of limited specialty. *Philos Constructs Chiropract Profession.* 1991;1:6-10.
50. Kirkaldy-Willis WH, Cassidy JD. Spinal manipulation in the treatment of low-back pain. *Can Fam Physician.* 1985;31:535-540.
51. Grice A, Vernon H. Basic principles in the performance of chiropractic adjusting: historical review, classification, and objectives. In: Haldeman S, ed. *Principles and Practice of Chiropractic.* Norwalk, Conn: Appleton & Lange; 1992:443-458.
52. Gitelman R, Fligg B. Diversified technique. In: Haldeman S, ed. *Principles and Practice of Chiropractic.* Norwalk, Conn: Appleton & Lange; 1992: 483-501.
53. DeJarnette MB. *Sacro Occipital Technic.* Nebraska City, Neb: MB DeJarnette; 1984.
54. Logan VF. *Logan Basic Methods.* St Louis, Mo: Logan College of Chiropractic; 1956.
55. Smith DB, Fuhr AW, Davis BP. Skin accelerometer displacement and relative bone movement of adjacent vertebrae in response to chiropractic percussion thrusts. *J Manipulative Physiol Ther.* 1989;12:26-37.
56. Bergmann TF. Manual force, mechanically assisted articular chiropractic technique using long and/or short lever contacts. *J Manipulative Physiol Ther.* 1993;16:33-36.
57. Bergmann TF. Various forms of chiropractic technique. *Chiropract Technique.* 1993;5:53-55.
58. Williams SE. The Mercy Conference document. *Am J Clin Chiropract.* 1993;3:1, 24.
59. Bartol KM. A model for the categorization of chiropractic treatment procedures. *Chiropract Technique.* 1991;3:78-80.
60. Wardwell WI. The cutting edge of chiropractic recognition: prosecution and legislation in Massachusetts. *Chiropract Hist.* 1982;2:54-65.
61. Keating JC Jr, Brown R, Smallie P. T. F. Ralledge, the missionary of straight chiropractic in California. *Chiropract Hist.* 1991;11:27-36.
62. Reed LS. *The Healing Cults. A Study of Sectarian Medical Practices: Its Extent, Causes and Control.* Chicago, Ill: University of Chicago Press; 1932.
63. Rothstein WG. *American Physicians in the 19th Century: From Sects to Science.* Baltimore, Md: Johns Hopkins University Press; 1985.
64. Gevitz N. The chiropractors and the AMA: reflections on the history of the consultation clause. *Perspect Biol Med.* 1989;32:281-299.
65. Getzendanner S. Permanent injunction order against the AMA [special communication]. *JAMA.* 1988;259:81-82.
66. Frymoyer JW. Back pain and sciatica. *N Engl J Med.* 1988;318:291-300.
67. Sternbach RA. Survey of pain in the United States: the Nuprin Pain Report. *Clin J Pain.* 1986;2:49-53.
68. Kahanovitz N. *Diagnosis and Treatment of Low Back Pain.* New York, NY: Raven Press; 1991.
69. Bonica JJ. Preface. In: Ng LKY, ed. *New Approaches to Treatment of Chronic Pain: A Review of Multidisciplinary Pain Clinics and Pain Centers.* Washington, DC: US Dept of Health and Human Services, National Institute on Drug Abuse; 1981:vii-x.
70. Mootz RD, Shekelle PG. Content of practice. In: Group Health Cooperative of Puget Sound, Seattle, Wash, Center for Health Studies, eds. *Chiropractic in the United States: Training, Practice, and Research.* Rockville, Md: US Dept of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research; 1997:67-90.
71. Hurwitz EL, Coulter ID, Adams AH, Genovese BJ, Shekelle PG. Use of chiropractic services from 1985 through 1991 in the United States and Canada. *Am J Public Health.* 1998;88:771-775.
72. Wardwell WI. The Connecticut survey of public attitudes toward chiropractic. *J Manipulative Physiol Ther.* 1989;12:109-121.
73. Nationwide survey yields insights into the public's views of chiropractic care. *ACA J Chiropract.* 1993;30:28-31.
74. Sanchez JE. A look in the mirror: a critical and exploratory study of public perceptions of the chiropractic profession in New Jersey. *J Manipulative Physiol Ther.* 1991;14:165-176.
75. Sawyer CE, Kassak K. Patient satisfaction with chiropractic care. *J Manipulative Physiol Ther.* 1993;16:25-32.
76. Cherkin DC, MacCornack FA. Patient evaluations of low back pain care from family physicians and chiropractors. *West J Med.* 1989;150: 351-355.
77. Kane RL, Olsen D, Leymaster C, Woolley FR, Fisher FK. Manipulating the patient: a comparison of the effectiveness of physician and chiropractor care. *Lancet.* 1974;1:1333-1336.
78. Bloch R. Methodology in clinical back pain trials. *Spine.* 1987;12:430-432.
79. Koes BW, Bouter LM, van der Heijden GJ. Methodological quality of randomized clinical trials on treatment efficacy in low back pain. *Spine.* 1995; 20:228-235.
80. Bergquist-Ullman M, Larsson U. Acute low back pain in industry: a controlled prospective study with special reference to therapy and confounding factors. *Acta Orthop Scand.* 1977;170:1-117.
81. Sims-Williams H, Jayson MI, Young SM, Baddeley H, Collins E. Controlled trial of mobilisation and manipulation for low back pain: hospital patients. *BMJ.* 1979;2:1318-1320.
82. Godfrey CM, Morgan PP, Schatzker J. A randomized trial of manipulation for low-back pain in a medical setting. *Spine.* 1984;9:301-304.
83. Gibson T, Grahame R, Harkness J, Woo P, Blagrove P, Hills R. Controlled comparison of short-wave diathermy treatment with osteopathic treatment in non-specific low back pain. *Lancet.* 1985; 1:1258-1261.
84. Waagen GN, Haldeman S, Cook G, Lopez D, DeBoer KF. Short term trial of chiropractic adjustments for the relief of chronic low back pain. *Manual Med.* 1986;2:63-67.
85. Ongley MJ, Klein RG, Dorman TA, Eek BC, Hubert LJ. A new approach to the treatment of chronic low back pain. *Lancet.* 1987;2:143-146.
86. Triano JJ, McGregor M, Hondras MA, Brennan PC. Manipulative therapy versus education programs in chronic low back pain. *Spine.* 1995; 20:948-955.
87. Glover JR, Morris JG, Khosla T. Back pain: a randomized clinical trial of rotational manipulation of the trunk. *Br J Ind Med.* 1974;31:59-64.
88. Sims-Williams H, Jayson MI, Young SM, Baddeley H, Collins E. Controlled trial of mobilisation and manipulation for patients with low back pain in general practice. *BMJ.* 1978;2(6148): 1338-1340.
89. Hoehler FK, Tobis JS, Buerger AA. Spinal manipulation for low back pain. *JAMA.* 1981;245: 1835-1838.
90. Evans DP, Burke MS, Lloyd KN, Roberts EE, Roberts GM. Lumbar spinal manipulation on trial, part 1: clinical assessment. *Rheumatol Rehabil.* 1978; 17:46-53.
91. Rasmussen GG. Manipulation in treatment of low back pain: a randomized clinical trial. *Manual Med.* 1979;1:8-10.
92. Coxhead CE, Inskip H, Meade TW, North WR, Troup JD. Multicentre trial of physiotherapy in the management of sciatic symptoms. *Lancet.* 1981;1:1065-1068.
93. Farrell JP, Twomey LT. Acute low back pain: comparison of two conservative treatment approaches. *Med J Aust.* 1982;1:160-164.
94. Nwuga VC. Relative therapeutic efficacy of vertebral manipulation and conventional treatment in back pain management. *Am J Phys Med.* 1982; 61:273-278.
95. Arkuszewski Z. The efficacy of manual treatment in low back pain: a clinical trial. *Manual Med.* 1986;2:268-271.
96. Hadler NM, Curtis P, Gillings DB, Stinnett S. A benefit of spinal manipulation as adjunctive therapy for acute low-back pain: a stratified controlled trial. *Spine.* 1987;12:702-706.
97. Postacchini F, Facchini M, Palieri P. Efficacy of various forms of conservative treatment in low back pain: a comparative study. *Neuro-Orthop.* 1988;6:28-35.
98. Hsieh CYJ, Phillips RB, Adams AH, Pope MH. Functional outcomes of low back pain: comparison of four treatment groups in a randomized controlled trial. *J Manipulative Physiol Ther.* 1992;15:4-9.
99. Doran DM, Newell DJ. Manipulation in treatment of low back pain: a multicentre study. *BMJ.* 1975;2:161-164.
100. Zylbergold RS, Piper MC. Lumbar disc disease: comparative analysis of physical therapy treatments. *Arch Phys Med Rehabil.* 1981;62: 176-179.
101. Waterworth RF, Hunter IA. An open study of di-lunical, conservative and manipulative therapy in the management of acute mechanical low back pain. *N Z Med J.* 1985;98:372-375.
102. Kinalski R, Kuwik W, Pietrzak D. The comparison of the results of manual therapy versus physiotherapy methods used in treatment of patients with low back pain syndromes. *J Manual Med.* 1989;4:44-46.
103. Mathews JA, Mills SB, Jenkins VM, et al. Back pain and sciatica: controlled trials of manipulation, traction, sclerosant and epidural injections. *Br J Rheumatol.* 1987;26:416-423.
104. MacDonald RS, Bell CM. An open controlled assessment of osteopathic manipulation in nonspecific low-back pain. *Spine.* 1990;15:364-370.
105. Koes BW, Bouter LM, van Mameren H, et al. The effectiveness of manual therapy, physiotherapy, and treatment by the general practitioner for nonspecific back and neck complaints: a randomized clinical trial. *Spine.* 1992; 17:28-35.
106. Shekelle PG, Adams AH, Chassin MR, Hurwitz EL, Brook RH. Spinal manipulation for low-back pain. *Ann Intern Med.* 1992;117:590-598.
107. Anderson R, Meeker WC, Wirrick BE, Mootz RD, Kirk DH, Adams A. A meta-analysis of clinical trials of spinal manipulation. *J Manipulative Physiol Ther.* 1992;15:181-194.
108. Assendelft WJ, Koes BW, van der Heijden GJ, Bouter LM. The efficacy of chiropractic manipulation for back pain: blinded review of relevant randomized clinical trials. *J Manipulative Physiol Ther.* 1992;15:487-494.
109. Meade TW, Dyer S, Browne W, Townsend J, Frank AO. Low back pain of mechanical origin: randomised comparison of chiropractic and hospital outpatient treatment. *BMJ.* 1990;300:1431-1437.
110. Meade TW, Dyer S, Browne W, Frank AO. Randomised comparison of chiropractic and hospital outpatient management of low back pain: results from extended follow-up. *BMJ.* 1995;311:349-351.

111. Kogstad OA, Karterud S, Gudmundsen J. Cervicobrachialgia: a controlled trial with conventional therapy and manipulation [in Norwegian]. *Tidsskr Nor Laegeforen*. 1978;98:845-848.
112. Cassidy JD, Lopes AA, Yong-Hing K. The immediate effect of manipulation versus mobilization on pain and range of motion in the cervical spine: a randomized controlled trial. *J Manipulative Physiol Ther*. 1992;15:570-575.
113. Brodin H. Cervical pain and mobilization. *Manual Med*. 1982;20:90-94.
114. Vernon HT, Aker P, Burns S, Viljakaanen S, Short L. Pressure pain threshold evaluation of the effect of spinal manipulation in the treatment of chronic neck pain: a pilot study. *J Manipulative Physiol Ther*. 1990;13:13-16.
115. Howe DH, Newcombe RG, Wade MT. Manipulation of the cervical spine: a pilot study. *J R Coll Gen Pract*. 1983;33:574-579.
116. Sloop PR, Smith DS, Goldenberg E, Dore C. Manipulation for chronic neck pain: a double-blind controlled study. *Spine*. 1982;7:532-535.
117. Aker PD, Gross AR, Goldsmith CH, Peloso P. Conservative management of mechanical neck pain: systematic overview and meta-analysis. *BMJ*. 1996;313:1291-1296.
118. Hurwitz EL, Aker PD, Adams AH, Meeker WC, Shekelle PG. Manipulation and mobilization of the cervical spine: a systematic review of the literature. *Spine*. 1996;21:1746-1760.
119. Parker GB, Tupling H, Pryor DS. A controlled trial of cervical manipulation of migraine. *Aust N Z J Med*. 1978;8:589-593.
120. Jensen OK, Nielsen FF, Vosmar L. An open study comparing manual therapy with the use of cold packs in the treatment of post-traumatic headache. *Cephalalgia*. 1990;10:241-250.
121. Boline PD, Kassak K, Bronfort G, Nelson C, Anderson AV. Spinal manipulation vs. amitriptyline for the treatment of chronic tension-type headaches: a randomized clinical trial. *J Manipulative Physiol Ther*. 1995;18:148-154.
122. Hoyt WH, Shaffer F, Bard DA, et al. Osteopathic manipulation in the treatment of muscle-contraction headache. *J Am Osteopath Assoc*. 1979;78:322-325.
123. Kokjohn K, Schmid DM, Triano JJ, Brennan PC. The effect of spinal manipulation on pain and prostaglandin levels in women with primary dysmenorrhea. *J Manipulative Physiol Ther*. 1992;15:279-285.
124. Boesler D, Warner M, Alpers A, Finnerty EP, Kilmore MA. Efficacy of high-velocity low-amplitude manipulation technique in subjects with low-back pain during menstrual cramping. *J Am Osteopath Assoc*. 1993;93:203-208.
125. Morgan JP, Dickey JL, Hunt HH, Hudgins PM. A controlled trial of spinal manipulation in the management of hypertension. *J Am Osteopath Assoc*. 1985;85:308-313.
126. Yates RG, Lamping DL, Abram NL, Wright C. Effects of chiropractic treatment for blood pressure and anxiety: a randomized, controlled trial. *J Manipulative Physiol Ther*. 1988;11:484-488.
127. Miller WD. Treatment of visceral disorders by manipulative therapy. In: Goldstein M, ed. *The Research Status of Spinal Manipulative Therapy*. Bethesda, Md: National Institutes of Health; 1975:295-302.
128. Powell FC, Hanigan WC, Olivero WC. A risk/benefit analysis of spinal manipulation for relief of lumbar or cervical pain. *Neurosurgery*. 1993;33:73-78.
129. Terrett A. Vascular accidents from cervical spine manipulation: report of 107 cases. *J Aust Chiropract Assoc*. 1987;17:15-24.
130. Lee KP, Carlini WG, McCormick GF, Albers GW. Neurologic complications following chiropractic manipulation: a survey of California neurologists. *Neurology*. 1995;45:1213-1215.
131. Krueger BR, Okazaki H. Vertebral-basilar distribution infarction following chiropractic cervical manipulation. *Mayo Clin Proc*. 1980;55:322-332.
132. Dvorak J, Orelli F. How dangerous is manipulation of the cervical spine: case report and results of a survey. *Manual Med*. 1985;2:1-4.
133. Assendelft WJJ, Bouter LM, Knipschild PG, Bouter SM. Complications of spinal manipulation: a comprehensive review of the literature. *J Fam Pract*. 1996;42:475-480.
134. Terrett AGJ, Kleynhans AM. Cerebrovascular complications of manipulation. In: Haldeman S, ed. *Principles and Practice of Chiropractic*. Norwalk, Conn: Appleton & Lange; 1992:579-598.
135. Haldeman S, Rubinstein SM. Cauda equina syndrome following lumbar spine manipulation. *Spine*. 1992;17:1469-1473.
136. Csordas TJ. The rhetoric of transformation in ritual healing. *Cult Med Psychiatry*. 1983;7:333-375.
137. Thomas KB. General practice consultations: is there any point of being positive? *BMJ*. 1987;294:1200-1202.
138. Bass MJ, Buck C, Turner L, Dickie G, Pratt G, Robinson HC. The physician's actions and the outcome of illness in family practice. *J Fam Pract*. 1986;23:43-47.
139. Engelbart HJ, Vrancken MA. Chronic pain from the perspective of health: a view based on systems theory. *Soc Sci Med*. 1984;19:1383-1392.
140. Oths K. Communication in a chiropractic clinic: how a DC treats his patient. *Cult Med Psychiatry*. 1993;18:83-113.