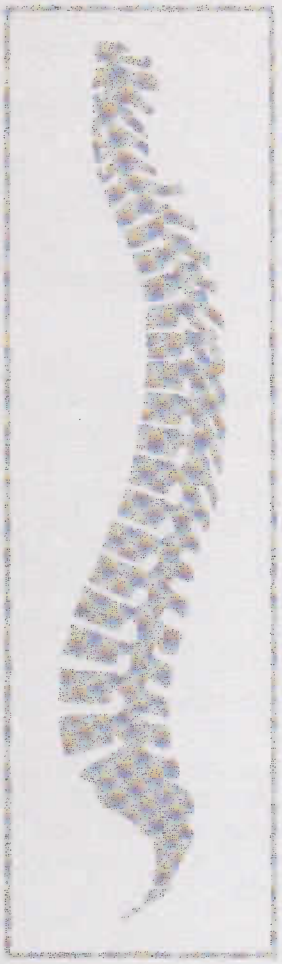

THE CHIROPRACTIC REPORT

An international review of professional and research issues, published bimonthly

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Professional Notes

BMA Supports Chiropractic in the U.K.

In Britain the practice of chiropractic is finally about to be officially regulated by legislation. The draft Chiropractors' Act received second reading in the House of Commons on February 18, 1994 and, supported by all political parties, should become law shortly.

A striking difference from the past, valuable for chiropractors in other countries seeking legislative protection of title through government licensure, is that the new chiropractic legislation also has the support of the British Medical Association (BMA). Last year the BMA published a new report entitled 'Complementary Medicine - New Approaches to Good Practice' (BMA, Oxford University Press 1993) which supported official recognition of chiropractic and the disciplines of acupuncture and osteopathy and noted:

- There is wide public acceptance of, and medical referral to, these disciplines.
- There is significant research on the effectiveness and safety of chiropractic.
- A profession such as chiropractic, which now has a discrete and established education and research base, should practise "alongside orthodox medical care" and be regulated on a similar basis.

The new act provides full protection of title. There is no explicit, and therefore limiting, legislative scope of practice - scope will be determined by the self-regulatory General Chiropractic Council.

Cervical Manipulation and Vertebral Artery Injury

A. Introduction

1. If this was a rational world few people would have heard of the risk of stroke from neck manipulation, whether performed by chiropractors or others. By any medical standard chiropractic cervical adjustment is an extremely safe treatment. Vertebral artery injury, causing stroke, is the only serious potential complication. There is a risk rate (incidence) of about .0002% - that is 2 cases per million treatments.[1,2,3,4,5,6]

Many more people should have heard of the much higher and more serious risk rates of many medical treatments for musculoskeletal pain, such as:

a) The comparatively spectacular risk rate of paralysis from neurosurgery for neck pain - 1.5% or 15,000 cases per million.[7]

b) The risk rate, described as "intolerable" by neurosurgeon Charles Fager, of 1400 *deaths* per million (a risk rate of .14%) from chymopapain injections for back and leg pain. This was the documented risk rate when the FDA approved this surgical technique in the US in 1982.[8]

2. Yet the world, alas, is far from rational. The media's love of sensation, allied with unprofessional and anecdotal comment from more reactionary voices in the medical profession, means that the public in Europe and North America has seen several headlines in recent years along the lines of "chiropractic manipulation can cause stroke, warn doctors". A recent item such as this, from Associated Press and published across the US, Canada and Europe in February, is one reason for this article. (For discussion see para 4 below).

Family physicians who would never think of warning their patients that there is a risk of stroke from neck positioning under anesthesia for general surgery, routinely warn patients not to let a chiropractor manipulate their necks or cervical spines. Public health nurses issue similar warnings to children in schools. This may be well-intentioned - it is also sadly misinformed, inconsistent with the views of neurologists[6] and those in the medical profession who use manipulation and are familiar with the scientific literature,[9,10] and a gross disservice to the public.

3. While the risk of harm from neck manipulation is very remote, like all risks it needs to be addressed seriously. This Report seeks to put the matter in perspective and looks at:

- The risks and benefits of neck manipulation.
- Mechanisms of potential injury.
- Patients at particular risk.
- The role of provocative tests.
- Legal issues and professional guidelines.

However, to conclude these introductory comments, here is a small exercise designed to serve as a reality check for those who have been influenced by headlines or anecdotal evidence suggesting neck manipulation involves unacceptable risk of harm. Compare these items of research published during the past year, and their public exposure.

Stroke from Neck Positioning during Manipulation

4. During 1993 Carlini et al, from the Stanford Stroke Center, California performed a survey to determine "the incidence of stroke following chiropractic manipulation."[6] Preliminary results were reported at a meeting sponsored by the American Heart Association in San Diego in February 1994. These revealed:

a) A questionnaire was mailed to the 488 California neurologists who were current members of the American Academy of Neurology. It asked them to give the number of patients seen in the past two years who had "suffered a stroke within 24 hours of cervical chiropractic manipulation."

b) There was a 36% response rate reporting a total of 56 incidents, 48 of which involved continuing neurological

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1995 Centennial Celebrations

Canada: May 31 to June 4, Toronto, Ontario. *United States:* July 5-10, 1995, Washington DC (incorporating the 1995 World Chiropractic Congress) and September 13-17, 1995, Davenport Iowa. Clear those dates now.

deficit. 25 of the strokes followed proven damage to a vertebral artery wall (arterial dissection demonstrated by angiography).

c) The researchers concluded that there was a "small but significant risk". On the basis of our results "we estimate that the incidence (of stroke) is about 1 in every 500,000 chiropractic manipulations."

Dr. Carlini emphasized that this was consistent with earlier studies and that "the safety of cervical chiropractic treatments is not being challenged by these findings." He expressly acknowledged that "most interventions by (medical) physicians have a higher complication rate." He expressed concern about raising "unnecessary fear".

5. During the following week the chiropractic profession was understandably dismayed - as one imagines Dr. Carlini was - to read an Associated Press item published in newspapers throughout North America and Europe headlined '*Twist of the Neck can Cause Stroke, Warn Doctors*'.[11] The AP article continued:

"Strokes may stem from a tear in one of the main arteries that carry blood to the head. Probably the best documented cause of rips - what doctors call dissections - is chiropractic manipulation."

"Every neurologist in this room has seen 2 or 3 people who have suffered this after chiropractic manipulation", said Dr. William Fowers of Washington University, St. Louis."

The article gave the impression, completely inconsistent with the facts and the research upon which it was based, that chiropractic adjustment involved unacceptable risk of harm. Its tone and intent, frankly, were reminiscent of Senator McCarthy.

I beg your pardon? Excuse me? An informal report of a retrospective study, with evident design problems as serious research, not yet published, providing no new conclusions, and not challenging the overall safety of chiropractic neck manipulation now suddenly generates a colorful warning to the public - and one said to be a warning from "doctors"? A few of the many other questions are:

i) Why does AP quote Dr. Fowers' irresponsible throwaway comment, which is proven wrong by the study?

ii) Why the focus on "chiropractic" cervical manipulation? A justification in the US may be that over 90% of manipulations are performed by chiropractors.[12] However neck manipulations are also performed, on the basis of considerably less training, by MDs, DOs and physical therapists. Since Kleynhans' impressive literature review in 1978[13] it has been known that a disproportionate number of the few complications in North America arise following medical manipulation. The only case of stroke following manipulation reported in the United Kingdom involved an osteopath.[14] The only case reported in New Zealand involved a physiotherapist.[15] These examples serve to underline how very rare the problem is.

iii) Why is chiropractic manipulation the most documented cause of vertebral artery dissection? Not because it is a common cause, as is implied, but because the chiropractic profession has published a wealth of research in this area. There have been over 20 text book chapters and journal articles during the past 10 years. Also because of medical over-reaction.

Stroke from Neck Positioning during General Anesthesia

6. Now compare this second report. Last year in the journal *Neurology*, Tettenborn et al reported the first study analyzing "the frequency and mechanisms of stroke after general surgery".[16] This was a well-designed prospective study. It included all cases referred to stroke referral centers in three major hospitals in the US (Baltimore, Boston and Charlottesville) and one in Germany (Mainz) over a two year period.

The researchers expected, and got, strokes due to emboli after cardiac/vascular surgery - in other words strokes caused by a clot or embolus from the site of surgery that travelled up and lodged in the brainstem, blocking the blood flow and causing a stroke.

They did not expect such strokes after general surgery. They ended up with 12, in 10 of which the cause was "neck position-related vertebral artery thrombosis" associated with anesthesia. In other words, extension and rotation of the neck caused damage to the wall of one of the two vertebral arteries. This caused a blood clot or thrombus, from which a piece (embolus) detached and travelled on in the bloodstream to lodge in the brainstem causing stroke.

7. Publication of this study led to a case report by Fisher, a neurologist at the Massachusetts General Hospital,[17] Boston reporting:

a) A 46 year old woman had uneventful ovarian surgery, but then suddenly died the next day. Pathologic examination revealed "a major embolus to the distal basilar artery" which Fisher concludes "was deposited within the vertebral system as a result of extension and rotation of the neck while the patient (was) anesthetized."

b) Fisher concludes that "this complication is not rare". The condition "should be preventable" and "anesthesiologists are generally unaware that such a hazard is under scrutiny."

8. In a rational world the study by Tettenborn et al is of more significance to public health and more newsworthy than that by Carlini et al. The former is a prospective completed, peer-reviewed, multicenter study. It draws attention to a significant source of harm not previously understood, and preventable.

The number of operations is not given, so there is nothing from which to calculate risk rate or incidence of harm. However there will certainly be a far higher risk of stroke from administration of anesthetics than chiropractic manipulation. (To have the same risk rate these four stroke referral centers would have had to service 4 million operations during the two year study period).

But this important study generated no media response. Comments are:

a) Medical readers will find it appropriate that there were no sudden headlines about a dangerous risk of stroke

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from anesthesia in general surgery. This Report agrees. Relevant considerations include risk/benefit ratio, the need for further research, and an appropriate balance and assessment of medical and public interests. (However there should have been many more public warnings about chymopapain therapy.)

b) Similarly, there should have been no widespread media comment discrediting neck manipulation following the California survey.

The balance of this Report now analyzes the small but significant risk of cervical adjustment, and reveals how well-researched and understood this is.

B. Definitions

9. Until the 1980s there was a tendency in the health science literature to call all manual joint treatments "manipulation" or "manipulative therapy". During the past decade the following distinction has been drawn in the international health science literature:

Manipulation: faster (high-velocity) techniques that take the joint beyond the passive range end barrier to what is known as the 'paraphysiological' space. Range of movement is greater. Because of the speed the patient does not have control. Potential for harm in unskilled hands is greater.

Mobilization: slower (low-velocity) techniques in which the joint remains within its passive range of movement. The treatment can be monitored and resisted by the patient, who therefore has final control.

There is now a significant body of research showing that manipulation has different and superior results to mobilization in reducing back pain,[18,19] reducing neck pain,[20] and increasing ranges of movement in a joint.[20,21] The following discussion uses these definitions.

C. Incidence of Stroke

10. It is generally agreed that the risk rate following neck manipulation is 1 to 3 more or less serious incidents per million treatments.[1,2,3,4,5,6] Accordingly the risk is very small. Jaskoviak DC reports from the National College of Chiropractic Clinics in Chicago that there were approximately 5 million cervical adjustments from 1965 to 1980 without a single case of vertebral artery injury or stroke.[22] Austrian manual medicine specialists Eder MD and Tilscher MD respectively report 78,000 manipulations over 15 years and 168,000 manipulation over 28 years without a single significant complication.[23]

11. The mortality rate remains speculative because death is so rare - maybe 1 in 20 million treatments. Terrett reviews the literature which shows one fatality worldwide across all professions every 4.2 years.[3]

12. Chiropractic, medical[10,25] and osteopathic[9] authors all agree that the risks of cervical manipulation are comparatively minor and do not represent a contraindication to its use except with respect to:

a) Certain patients at risk (see para 16).

b) Techniques that employ full rotation and extension in the upper cervical spine.

D. Benefits

13. Risk must be weighed against benefit. Some medical doctors, particularly in North America, are unfamiliar with the formal and informal evidence of effectiveness. It is noted:

a) **Neck pain**. There have now been 12 randomized controlled trials of manual therapy, manipulation and mobilization, for neck pain. Summarizing their results, Nikolai Bogduk MD PhD, Professor of Anatomy and Director, Cervical Spine Research Unit, University of Newcastle, New South Wales, Australia says:

"... Early manual therapy has been shown to be superior to rest and a collar in the management of acute whiplash ... Of all the various therapies for neck pain only early manual therapy for whiplash has been vindicated in the literature ... Collars and other passive measures are not justified if formal manual therapy is available for this particular problem."[24]

There has only been one trial comparing the effectiveness of chiropractic manipulation and mobilization (muscle energy techniques), and this reports superior results for chiropractic manipulation - both in terms of increased ranges of motion and reduction of pain.[20]

Medical doctors with long experience of cervical manipulation testify to its effectiveness for neck pain. Maigne, a prominent French manual medicine specialist, concludes that cervical post-traumatic pain "reacts well to manipulation ... and offers still better therapeutic opportunities for manipulation (than acute low-back pain)."[25]

b) **Headache and Migraine**. There is only one controlled trial of manual therapy for migraine, by a multidisciplinary team in Australia. This showed that manipulation and mobilization were effective in the management of both common and classical migraine.[26,27,28] With respect to chronic tension headaches, a new trial (n 150) by Boline DC et al in the US reports that chiropractic adjustment is more effective than medication (amiltriptyline), both after a four week course of treatment and at one year follow-up.[29]

Vernon DC reviews the various prospective studies of manipulation for headache and migraine in Europe and North America, by doctors of medicine and chiropractic, which consistently report success rates of approximately 80%.[30]

Cervical manipulation has a valuable role in integrated care. In the US Graff-Radford et al reported a 90% reduction in drug use and "highly significant reduction in self reports of pain" in 25 patients with chronic myofascial head and neck pain (average duration 11.25 years) when they were switched from medication and physical therapy to an integrated treatment program comprising cervical manipulation to eliminate joint dysfunction, spray and stretch techniques for trigger point muscle problems, instruction on psychological relaxation skills, and teaching of specific home exercise programs.[31]

c) **Vertigo**. There are no controlled trials. The largest prospective study (n 235), by Fitz-Ritson DC, reported a 90% success rate where management included mobilization initially, followed then by manipulation together with muscle conditioning.[32] Lewit, a Prague neurologist who has published similar studies and is prominent internationally in the field of manual health care, says:

"It is important to stress that a cervical factor may be present in all forms of vertigo and dizziness ... in no field is manipulation

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more effective than in the treatment of disturbances of equilibrium."[33]

d) **Textbooks**. Chiropractic authorities support the value of cervical adjustment or manipulation in major texts. See, for example, chapters by Cleveland III DC, and Gitelman DC and Fligg DC, in *Principles and Practice of Chiropractic* edited by Haldeman DC MD PhD.[34] So do medical authorities. For a widely accepted North American osteopathic/ medical text see Greenman DO,[9] and for a similar European medical text see Eder and Tilscher[10] - both of these advocate and illustrate a variety of techniques of cervical manipulation.

E. Mechanisms of Injury

14. For an excellent, detailed analysis see Terrett DC and Kleynhans DC.[35] In summary:

a) Figures 1 and 2 illustrate how the two vertebral arteries lie within bony rings as they pass up the sides of the vertebrae in the cervical spine. These arteries remain vertical until the top two vertebra, at which point they take a quite tortuous path before joining to form the basilar artery at the top and back of the spine.

b) Rotation and extension (with the chin up) of the upper cervical spine may unusually stretch and/or pinch a vertebral artery causing either:
i) Vasospasm, or
ii) Injury to the wall of the artery (e.g. intimal tear, dissection with subintimal hematoma, etc.).

Depending upon the exact type of injury the blood flow to the brainstem may be blocked (ischemia) causing a stroke. This may happen immediately (e.g. ischemia caused by vasospasm or an embolus travelling to plug an artery in the brainstem) or over a few days (e.g. injury to the artery wall gradually causing a thrombus or clot, which later releases an embolus). In approximately 80% of cases symptoms arise within the first hour, usually immediately.[36]

c) Extreme rotation, especially in extension, is the main problem. Full rotation to the right may stretch or pinch the vertebral artery on the left. Martienssen DC and Nilsson DC MD reviewed all the case reports of stroke where type of manipulation was known - 45 of the 49 involved rotation techniques.[37]

d) The extent and duration of rotation and extension are the main risk factors, rather than force or speed. Therefore there is risk from mobilization as well as manipulation. This is evidenced by the fact that stroke from neck movements is reported in the literature with respect to swimming, fitness exercises, yoga, falling asleep, turning to reverse a car, eye examinations, archery, overhead work, and neck extensions for reasons such as a bleeding nose or radiography.[16,35] Added to that list now is being anesthetized for surgery.[35]

e) For chiropractors it is important to note that stroke from vertebral artery injury may be spontaneous, that the first symptom may be neck pain or headache, and that such a patient may consult a chiropractor. Swenson DC MD PhD reviews a recent case of this nature.[38]

f) A clear message from the above mechanisms of injury is that a repeat manipulation after signs and symptoms of stroke is a mistake - it can only aggravate the problem.

g) A past history of successful cervical adjustments provides no guarantee of safety. Most victims have been treated more than once before suffering complications.

h) Of the few patients who suffer stroke, most recover - neurological deficit (loss) is transient or temporary and rapidly resolves. Serious cases, involving permanent paralysis and the 'locked in' or Wallenberg syndrome, arise principally from complete blockage of one of the posterior inferior cerebellar arteries (PICA), which branch off each of the two vertebral arteries just before they join to form the basilar artery.

F. Signs and Symptoms of Stroke

15. Signs and symptoms of brainstem ischemia following manipulation include:

- Dizziness/vertigo
- Loss of consciousness (syncope, stupor)
- Visual problems
- Nausea and/or vomiting
- Walking difficulties/incoordination of the extremities/ataxia
- Numbness on one side of the body.
- Tinnitis (ringing in the ears)
- Speech problems, e.g., dysarthria.
- Nystagmus (involuntary rapid eye movements)

G. Patients at Greatest Risk

16. After analyzing the reported cases to 1987, Terrett concludes that risk is not related to any age group or either sex.[3] There is a slight over-representation in young adults, but that may just reflect the population being treated. Terrett and Kleynhans report:

a) The most important risk factors to identify are a history of vertigo or ischemic attacks, and any link between these and neck position.

b) Symptoms of transient ischemic attacks (TIAs) due to vertebral artery compromise are those mentioned in para 15 above.

c) Pre-disposing factors may arise from the neck vertebrae (abnormal structure and presence of degenerative bone spurs or osteophytes), the vascular system (hypertension, cardiovascular disease, TIAs), the nervous system (family history of strokes, visual disorders, headaches) and injury (whiplash).

d) Cigarette smoking (decreased cerebral artery blood flow) and use of oral contraceptives (increased risk of vertebrobasilar thrombosis - but with the embolus coming from the heart or lungs not the vertebral arteries) increase the overall risk of stroke.

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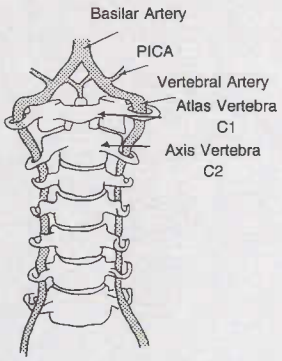
Relationship of the Vertebral Arteries to the Cervical Spine

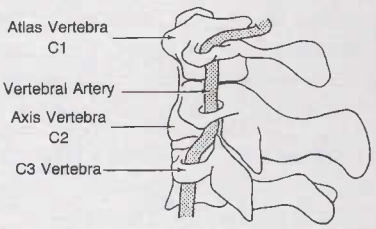
Figure 1



Pica = posterior inferior cerebellar artery

From Terrett and Kleynhans (1992)[35]

Figure 2



Shows the top 3 cervical vertebrae illustrating the vertebral artery changing direction at C2-C3 as a result of rotation of the C3 vertebra

H. Preventative Tests

17. Provocative tests, such as George's or the Wallenberg, are widely used in chiropractic practice. These test for signs and symptoms of restricted blood flow (ischemia). The patient's head is held in a pre-manipulative position of rotation, or rotation and extension, for up to 40 seconds. If ischemic symptoms appear, which is usually within 10 seconds, manipulation in that position should not be considered.

18. These tests do identify patients at risk, and are accordingly important. However they are not foolproof. They involve similar range of motion to manipulation, but not the thrust - as a result they do not guarantee that a thrust will not injure the artery wall.

19. Other issues are:

a) The test may itself cause a stroke, the unfortunate experience of one osteopath in the United Kingdom.[14]

b) There is a problem of false positives. Vertigo and nystagmus, for example, are not the only signs of ischemia. They also arise from stimulation of muscle and joint receptors and sympathetic nerves in the cervical spine. In the latter case, manipulation is a valuable treatment approach and, as Fitz-Ritson has shown for vertigo, can be highly effective.[32]

c) Finally, a new study from Canada by Thiel DC Wallace MD et al, throws doubt upon earlier studies which have suggested that these provocative tests reduce vertebral artery blood flow.[39] In both a control group (n 30 - no dizziness or other symptoms on use of the Wallenberg test) and an experimental group (n 12 - a positive Wallenberg test and a history of dizziness and other symptoms related to neck position) blood flow was measured using Doppler ultrasound. This, unlike earlier studies which used continuous wave ultrasound, allowed for accurate blood vessel identification and realtime imaging. Results showed:

i) The Wallenberg test had no significant effect on reducing blood flow, in either group of patients.

ii) This was so even in patients where a vertebral artery was malformed or of reduced size, and therefore had a decreased blood flow in resting position.

I. Legal Issues and Practice Guidelines

20. Whether the patient should be warned of the very remote risk of stroke from cervical manipulation is both a professional and legal issue. Gutmann MD, a leader in manual medicine in Germany and Europe thinks not in a 1983 article in *Manuelle Medizin*.[5] Few medical specialists would think of warning of a risk rate under 1%, let alone a .0002% risk rate.

21. **Law**. The law varies in each jurisdiction. However the strong trend towards patient rights in most countries suggests that there is a growing legal duty to disclose any known risk of serious harm, such as stroke or death, however remote. Failure to do so will mean that there is no valid informed consent to treatment, and that the practitioner will be liable in negligence if the risk materializes. There is a case in point in Canada, Mason v Forgie,[40] where a chiropractor was found negligent notwithstanding that all other aspects of his examination and treatment were performed with reasonable care and skill. The court applied this summary of the law from a previous medical case before the Supreme Court:

"A risk which is a mere possibility ordinarily does not have to be disclosed, but if its occurrence may result in serious consequences, such as paralysis or even death, then it should be treated as a material risk and should be disclosed."[41]

In this New Brunswick case leave to appeal to the Supreme Court of Canada was denied. It is unclear whether this decision would be followed in other Canadian provinces or other countries.

22. Health professionals are sometimes not unduly concerned by the law. In various medical specialties doctors decide not to inform patients of comparable risks in the knowledge that, if the risk comes up, they will be found negligent. They have insurance for that real but remote possibility. The rationale is that it is better to assume this risk than have patients over-react to serious but remote risks and refuse needed care.

23. **Practice Guidelines**. In the United States[42] and Canada[43] there are now formally-developed, nationally-based chiropractic practice guidelines that contain relevant provisions. Both sets of guidelines have an extensive literature review on vertebrobasilar artery injury in chapters on contraindications to adjustment or manipulation. Relevant guidelines include:

a) Clinical manifestations of vertebrobasilar insufficiency syndrome warrant particular caution and represent a relative to absolute contraindication to cervical high-velocity thrust procedures to the area of pathology (US p.175, Canada p.145).

b) The Canadian guidelines, which contain a separate chapter on consent, include:

"Chiropractors must disclose .... any material risks including those that may be of a special or unusual nature .... even though a certain risk may be a very remote possibility, if it carries a risk of serious harm, it is a material risk and requires disclosure."

"Consent may be given orally or in writing. The best record of consent is one that is objectively documented." (pp.4-5. For the equivalent U.S. guidelines, see p.90.)

The Canadian guidelines give a sample consent form. This refers specifically to "stroke" and "serious neurological injury", and this degree of frankness is probably necessary for a valid informed consent under Canadian law. This reflects a North American world that is placing greatly increased emphasis on patient rights, and in which people sign written consents for everything from a dental extraction to children's half-day school trips.

24. The Australian Physiotherapy Association has developed a protocol for pre-manipulative testing of the cervical spine and a recommended *verbal* consent for use immediately prior to treatment.[44] This verbal consent, couched in softer language that would not provide legal protection in North America, is:

"I wish to manipulate your joint using a quick movement in the position in which I am holding your neck. You may hear a click and this is normal. Neck manipulation can be dangerous but this is extremely uncommon. I have carried out the recommended precautionary tests and in my opinion there is little risk in your case. Are you agreeable for me to go ahead?"

Many practitioners may see this as meeting ethical or professional responsibilities. Advocates of patient rights would probably disagree, seeing this statement as 'too little too late' when the patient is poorly placed to make a judgement or assert his/her opinion.

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J. Conclusion

25. Spinal manipulation, whether for back pain, neck pain or anything else, has been an ugly duckling in health care. One reason has been the separate development of the professions of chiropractic and osteopathy. Another has been medicine's aloofness, in education and practice, to the whole field of manual diagnosis and treatment of biomechanical disorders of the neuromusculoskeletal system.

26. In the field of low-back pain spinal manipulation is now the swan, vindicated by extensive research during the past 15 years. There have been 24 controlled trials, far more than for any other treatment method. The recent Manga Report, an independent expert report commissioned by the Ontario government, finds chiropractic manipulation to be superior to all other methods of treatment of mechanical low-back pain in terms of safety, effectiveness, cost-effectiveness and patient satisfaction.[45] New management guidelines for back pain published by the Department of Health and Social Services in the U.K. give first priority to NSAIDs and manipulation and encourage family physicians to refer to chiropractors, osteopaths and physiotherapists.[46]

27. In the field of management of neck pain and cervical headache there is a similar move from rest, medication and passive management to early manual care and exercise. Leading chiropractic medical and osteopathic authors agree that manipulation is safe and effective and produces superior results to mobilization. The controlled trial research evidence is not yet as strong as for back pain but is now evolving in a similar way.

28. In this environment it is right that irresponsible public warnings of the danger of chiropractic manipulation should be exposed. It is important for the public and the medical profession to understand that the risks of harm from neck manipulation are minimal compared with the risks of medication and surgery for the conditions being treated, and that most neurologists reporting on the subject in the 1990s - as in a California survey this year - do not question the overall safety and value of cervical manipulation.

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