

A narrative review of the published chiropractic literature regarding older patients from 2001–2010

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Introduction: *The purpose of this article was to perform a narrative review of the chiropractic literature regarding older patients between 2001 and 2010.*

Methods: *A three step search strategy of the literature involved electronic searching, hand searching and reference tracking.*

Results: *One hundred and eighty eight articles germane to chiropractic geriatric practice and education were retrieved.*

Discussion: *Compared to the review of the literature conducted prior to 2000, the number of references on chiropractic geriatric education increased from 3 to 11, the number of demographic studies increased from 9 to 18, the number of case reports increased from 25 to 83, the number of clinical trials increased from 4 to 21 (only two RCTs found) and the number of references on clinical guidelines and general clinical information increased from 18 to 55.*

Conclusion: *This review found 188 retrievable articles available to practitioners to effectively care plan for their older patients, a better than three fold increase in the number of references found during a similar review conducted at the end of the previous decade. However, there is clearly a gap in the evidence base of chiropractic geriatric care, particularly the under-representation of clinical trials of all kinds involving older chiropractic patients.*

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KEY WORDS: geriatric, chiropractic, older patient

Introduction : *Le but de cet article était de faire une revue narrative de la littérature chiropratique au sujet des patients plus âgés entre les années 2001 et 2010.*

Méthodes : *Une stratégie de recherche à trois étapes de la littérature comprenait la recherche électronique, la recherche manuelle et le suivi de références.*

Résultats : *Cent quatre-vingt huit articles pertinents à la pratique de chiropractie gériatrique et à l'éducation furent retracés.*

Discussion : *En comparaison avec la revue de documentation réalisée avant l'année 2000, le nombre de références sur la formation de la chiropractie gériatrique est passé de 3 à 11, le nombre d'études démographiques est passé de 9 à 18, le nombre de rapports de cas est passé de 25 à 83, le nombre d'essais cliniques est passé de 4 à 21 (seulement deux essais cliniques aléatoires trouvés), et le nombre de références sur les principes directeurs des activités cliniques et sur l'information clinique générale est passé de 18 à 55.*

Conclusion : *Cette recherche a recensé 188 articles mis à la disposition des praticiens pour planifier efficacement des soins pour leurs patients plus âgés, une augmentation de plus de trois fois le nombre de références trouvées au cours d'une étude similaire menée à la fin de la décennie précédente. Toutefois, il y a clairement un fossé dans les soins de chiropractie gériatrique fondés sur l'expérience clinique, en particulier la sous-représentation d'essais cliniques de toutes sortes impliquant des patients de chiropractie plus âgés.*

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MOTS CLÉS : gériatrique, chiropractie, patient plus âgé

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Introduction

After World War Two, the surge in the birth rates in the Allied Power countries (i.e. Canada, the United Kingdom, Australia and the United States) began what is now colloquially referred to as the “baby boom,” with this demographic group spanning the years between 1946 and 1965.¹ The Boomers represent the largest single demographic cohort in these countries and their influence, in terms of sheer numbers, monetary impact and political clout has been felt in virtually every socio-cultural institution, from education to labour to healthcare.¹ The year 2011 is something of a watershed moment since the leading edge of the Boomers will turn 65 years old, the age traditionally associated with turning “old” since it is the age of eligibility for most national entitlement programs (social insurance, for example).

Several years ago, this author conducted a review of the literature on *chiropractic geriatric care* prior to the year 2001 in an attempt to further strengthen the profession’s cultural authority and establish an evidence-based care approach.² Since that time, there has been an exponential growth in the number of publications and presentations on this topic and it would therefore be timely to perform a narrative literature review of the chiropractic literature regarding older patients during the intervening years, published between 2001 and 2010.

Methods

Search Strategy

A three step literature review strategy was employed for this study. The first step involved a conventional electronic literature search using the following search strategy: The databases Index to Chiropractic Literature, PubMed and CINAHL were searched from 2000–2010 (English only) to August 2010. The Index to Chiropractic Literature was searched using subject headings “Aged” or “Geriatrics” or “Geriatric Assessment” and text words: senior* or older or geriatric* or elder.* PubMed was searched using text word chiropract* and the following MeSH terms: Accidental Falls, Geriatric Assessment, Health Services for the Aged, and (Aged or Aged 65+ or 80. Key words “Manipulation,” “Spinal Manipulation,” and “Chiropractic” were combined with the age limiters and the search also included “In Process” records for Chiropract* using the EBSCO MEDLINE. The same search strategy was used to search CINAHL.

This strategy yielded 112 articles, 3 of which, upon subsequent review, were found to be introduction and subsequent discussion of the same case study. Fourteen of the articles found did not meet the inclusion requirements (see below); thus, this search strategy yielded 95 relevant citations.

The second step of this review involved hand-searching chiropractic journals (Journal of the Canadian Chiropractic Association, Journal of Chiropractic Medicine, Journal of Chiropractic Education, Journal of Manipulative and Physiological Therapeutics, Clinical Chiropractic, Topics In Clinical Chiropractic, Journal of Neuromusculoskeletal Systems, and Journal of the American Chiropractic Association) and two international chiropractic conferences (World Federation of Chiropractic and Association of Chiropractic Colleges – Research Agenda Conference) between 2001–2010. However, in order to not over-inflate the number of references retrieved by this review, if a topic was presented at a conference and subsequently published in a peer-reviewed journal, those manuscripts were combined and only counted once. Since this article is meant to capture all the literature germane to chiropractic and older patients, a decision was made to include conference proceedings even though it must be emphasized that the level of peer review for such conferences is often much less stringent than it is for publication of manuscripts in indexed journals. The reader is reminded that this study is a tabulation of the literature retrievable between 2001 and 2010 and not a systematic review of that literature. That said, the next step will be to conduct a systematic review of the case series, systematic reviews, observational studies and randomized clinical trials retrieved during this study.

The third step of this study was reference tracking (reviewing the references of many of the articles retrieved by the first two search strategies to further capture other pertinent references). This tertiary step yielded additional source material, principally in the form of textbook chapters, conference workshops, government briefs, Cochrane Reviews and Guidelines from organizations such as the American Geriatric Society and the World Health Organization; however, those references not specifically germane to *chiropractic geriatric care* are listed under “*miscellaneous references*” and were not included in the final tally.

Inclusion Criteria

All citations found that discussed *chiropractic* and patients *age 55 years* and older published between 2001–2010 have been included in this study, following the example of the review article that characterized older chiropractic patients published by Hawk et al. in 2000.³ Studies that involved mixed populations^{4–13} were excluded; however, studies that utilized “osteopathic manipulation” were included in this study given the biomechanical similarity of this modality in the chiropractic and osteopathy professions. Lastly, articles that were included in the previous review by Gleberzon² were not included in this review even if they appeared in any of the search strategies employed.

Grouping of the articles retrieved during this study was problematic given the divergent nature of many of these studies. It was therefore decided that, in order to facilitate the comparison of the articles retrieved during this study with the articles retrieved from the previous study published in 2001² the same topic headings would be used: These were:

- (a) *chiropractic geriatric education* (this included articles that discuss education and training of students in the area of geriatric care taught at accredited chiropractic colleges);
- (b) *demographics and epidemiological studies* (this included studies on utilization rates of chiropractic services by older patients and the characteristics of those patients);
- (c) *case reports and case series*
- (d) *clinical trials* (this includes outcome studies, observational studies as well as practice-based and randomized clinical trials) and;
- (e) *guidelines and other clinical information* (this was often in the form of general information for patient care and systematic reviews on a particular topic such as falls prevention).

To better position the articles retrieved, manuscripts that discuss clinical trial protocols, patient recruitment or study feasibility have been included in section (d) *clinical trials* under a sub-heading of “*clinical trials to be conducted.*” Retrieved articles that are thematically-based reviews (i.e. fall prevention, assessment procedures for older patients, importance of exercise for the elderly) have been included under section (e) *guidelines and clinical information* (see Table 1).

Where ever possible, articles are ordered first chronologically (by year of publication) and then alphabetically (by last name of first author) in each sub-heading.

Results

(a) *Geriatric Chiropractic Education (n = 11)*

Eleven articles were found on geriatric chiropractic education. On these articles, six^{14,17,20–23} discussed the structure and development of the geriatric courses in the core curriculum or as an elective at specific chiropractic colleges (often emphasizing the importance of an interdisciplinary approach), one discussed the development of a community-based program for interns,¹⁵ one specifically described strategies to combat ageism through student education,¹⁶ two discussed developing “Best Practices” for older patients^{18,19} and one article was a survey of all chiropractic courses offered in North America.²⁴

(b) *Demographics and Epidemiological Studies (n = 18)* *Studies investigating utilization rates of chiropractic services by older patients and characteristics of older people who seek out chiropractic care (n = 14)*

Fourteen articles were found that essentially identified the types of complementary and alternative medicines (CAMs) in general and chiropractic care in particular, that older persons sought out and the characteristics that predicted they would do so.^{25–28} Each study involved different survey instruments and sought to gather different information. In general, taken as a group, these articles indicated that CAM use was high among older patients and that they most commonly sought out herbal remedies, chiropractic or massage therapy in various order depending on the reference. Acupuncture was the next most common CAM modality reportedly used by older patients. Predictors of CAM use in general and chiropractic use in particular were being female^{34,37} [with the exception of the article by Ness et al²⁷ which reported men were more likely to seek out chiropractors although less likely to seek out CAM providers in general], having a higher education,^{33,35,37} higher income,^{27,29,35} more frequent visits to physicians,^{27,29} alcohol use^{27,29} and being able to drive.²⁹ Also, older patients who identified themselves as being more spiritual were more likely to seek out CAM care.^{33,34,37} African-American^{29,34} and Hispanic^{29,34} patients were less likely than Caucasians to seek out CAM

Table 1 Articles retrieved by search strategy of this study published between 2001 and 2010 ($n = 188$)

| Type of Study | Subheading | Number of references retrieved |
|--|--|--------------------------------|
| Chiropractic geriatric education ($n = 11$) | | 11 |
| Demographic and Epidemiological studies ($n = 18$) | Utilization rates of chiropractic services by older patients and their demographic characteristics | 14 |
| | Epidemiological studies on older patients and predictors of pain | 4 |
| Case Reports & Case Series ($n = 83$) | Successful management of clinical condition by chiropractor | 39 |
| | Serious clinical condition masquerading as back pain | 40 |
| | Adverse reactions to manipulation | 2 |
| | Case series | 2 |
| Clinical Trials ($n = 21$) | Clinical trials not yet conducted | 8 |
| | Clinical trials involving older patients not involving manual therapy | 5 |
| | Clinical trials involving older patients involving manual therapy | 8 |
| Guidelines & Clinical Information ($n = 55$) | General practice guidelines for chiropractic care planning for older patients | 42 |
| | Workshops, Conference Platform & Other Chiropractic Geriatric References | 13 |

or chiropractic care. This data is similar to the information gathered by Hawk et al. in 2000.³

Older patients most commonly sought out CAM providers for pain-related symptoms,^{26,29,30,37,38} most notably various types of arthritis.^{29,30} Second to pain, one study indicated that older patients sought out chiropractic care to improve their quality of life²⁶ and two studies reported older patients sought out chiropractic care for health maintenance.^{26,30} This finding is similar to an earlier study by Rupert et al.³⁹ Older patients reported being satisfied with the care they received in two studies^{30,33} and respondents in another study reported the care they received was bene-

ficial to them.²⁶ These findings are also consistent with early studies by Hawk et al.³ and Rupert et al.³⁹

Epidemiological studies involving older patients and predictors of pain ($n = 4$)

Four studies sought to investigate various factors influencing the development of back pain among older persons.^{40–43} D'Astolfo and Humphreys⁴⁰ reported that the majority of residents in a long term care (LTC) facility in Ontario were women, osteoporotic with mild to moderate dementia but low levels of depression and could walk independently or with an assistive device. Three studies by

Hartvigsen et al.^{41–43} reported that genetic factors played a modest role in older men developing low back pain but no role in older women⁴¹ and genetic factors did not play an important role at all among either group of older patients with respect to neck pain.⁴² However, Hartvigsen et al. did confirm that commonly held belief that strenuous physical activity at least once a week is a protective factor against the development of low back pain, based on a review of 1387 older twins aged 70–100 years.⁴³

(c) Case Reports and Case Series (n = 83)

In general, case studies fell into two distinct groups: Those studies that (i) chronicled the successful management of a diagnosed clinical condition^{44–82} ($n = 39$) or that (ii) chronicled a more serious clinical condition masquerading as uncomplicated back pain that was diagnosed by the clinician or upon subsequent referral^{83–122} ($n = 40$). There were two case reports of adverse reactions to manipulation among older patients with complicated clinical profiles^{123,124} and two case series^{125,126} were retrieved in this study.

Successful management of diagnosed clinical conditions by chiropractors (n = 39)

Thirty-nine articles chronicled the successful management of the following clinical conditions treated with a plethora of presenting chief complaints. These were: osteoarthritis of the knee,⁴⁴ chronic constipation,⁴⁵ lumbar spinal stenosis,⁴⁶ “unsuccessful” post-cervical surgery,⁴⁷ cleidocranial dysplasia,⁴⁸ diffuse idiopathic skeletal hyperostosis^{49,50} cervical spine stenosis and radiculopathy,⁵¹ “low force adjustments,”⁵² greater occipital neuralgia,⁵³ two cases of cervical spondylotic radiculopathy,⁵⁴ spondylosis of L2 in identical twins,⁵⁵ acute fracture of the eighth thoracic vertebrae,⁵⁶ far lateral disk herniation,⁵⁷ grade II acromioclavicular joint separation,⁵⁸ cervical spine stenosis,⁵⁹ upper cross syndrome,⁶⁰ atypical polymyalgia rheumatica,⁶¹ two cases of lumbar spine synovial cysts,⁶² gemelli-obturator internus complex,⁶³ bilateral shoulder pain subsequent to a fall,⁶⁴ subacute lumbar compartment syndrome,⁶⁵ cervical spondylosis and ossification of the posterior longitudinal ligament,⁶⁶ myelopathy,⁶⁷ medically-treated asthma,⁶⁸ depressive symptoms in an elderly patient with LBP,⁶⁹ post-polio syndrome,⁷⁰ “apparent mechanical” femoral neuropathy,⁷¹ delayed-onset post-traumatic headache subsequent to a motor vehicle

accident,⁷² spinal synovial cysts with intersegmental instability,⁷³ vertebral artery calcification,⁷⁴ acute idiopathic costochondritis,⁷⁵ chronic migraine,⁷⁶ intractable back pain associated with compression fracture treated by percussion vertebroplasty,⁷⁷ adhesive capsulitis and improvement in kyphoscoliosis,⁷⁸ cervicogenic headaches,⁷⁹ lateral epicondylitis,⁸⁰ tarsal tunnel syndrome⁸¹ and lumbar stenosis resulting in low back and knee pain using Class IV laser.⁸²

Serious clinical conditions masquerading as back pain (n = 40)

Forty articles discussed the diagnosis of a serious clinical condition initially attributed to mechanical back pain or an otherwise relatively innocuous problem. These articles chronicled the following clinically significant conditions presenting among older patients to chiropractors’ offices: B-cell lymphoma masquerading as low back and leg pain,⁸³ heart failure and insufficiency of aortic and mitral valve secondary to rheumatoid arthritis,⁸⁴ fracture of heterotrophic bone fracture in patient with myositis ossificans traumatica,⁸⁵ cervical fracture-dislocation,⁸⁶ neuropathic arthropathy in the foot of a patient with diabetes,⁸⁷ porcelain gallbladder presenting as low back and heel pain,⁸⁸ post-traumatic compression fracture,⁸⁹ bizarre neurological symptoms precipitated by a fall diagnosed as Dejerine-Roussy Syndrome,⁹⁰ atypical presentation of a deep vein thrombosis,⁹¹ popliteal aneurysm presenting as leg pain,⁹² comorbidity of low back pain (LBP) and abdominal aortic aneurysm,⁹³ prostatic metastasis causing LBP and leg pain,⁹⁴ bilateral acrometastasis secondary to breast cancer,⁹⁵ breast cancer presenting as sacroiliac pain and radiculopathy,⁹⁶ low back pain caused by disk herniation visible upon surgical inspection but not on advanced imaging,⁹⁷ abnormal course of vertebral artery found in a cadaver,⁹⁸ congestive heart failure presenting as neck and shoulder pain,⁹⁹ malignant pleural mesothelioma,¹⁰⁰ vertebral osteomyelitis presenting as LBP,¹⁰¹ fracture of the hip mimicking LBP and hip pain,¹⁰² abdominal aortic aneurysm presenting as back pain,¹⁰³ osteomyelitis of the knee causing LBP,¹⁰⁴ pathological fracture of C2 subsequent to vertebral metastasis,¹⁰⁵ erosive osteoarthritis resulting in bilateral hand pain,¹⁰⁶ gout resulting in wrist,¹⁰⁷ bone infarct (osteonecrosis) presenting as knee pain,¹⁰⁸ Parkinson’s disease masquerading as LBP,¹⁰⁹ knee pain diagnosed as a Schwannoma,¹¹⁰ abdominal aortic aneur-

ysm,¹¹¹ metastasis from breast cancer presenting as non-specific back pain,¹¹² thoracic spine pain attributed to upper gastrointestinal hemorrhage,¹¹³ minimally response carpal tunnel syndrome diagnosed as avascular necrosis of the scaphoid,¹¹⁴ spontaneous cervical epidural hematoma presenting as severe neck pain,¹¹⁵ chronic low back pain diagnosed as vertebral sarcoidosis,¹¹⁶ renal cell carcinoma causing LBP,¹¹⁷ hyperparathyroidism presenting as back pain and swelling of fourth digit,¹¹⁸ brain stem compression and atlantoaxial instability secondary to rheumatoid arthritis presenting as chronic neck pain,¹¹⁹ detection of aortic abdominal aneurysm,¹²⁰ abdominal and low back pain diagnosed as metastasis from prostate cancer¹²¹ and Paget's disease resulting in progressive thoracic pain.¹²²

Adverse reaction to manipulation among older patients (n = 2)

Two articles discussed adverse reactions to manipulation among older patients with serious clinical conditions. In one case, a spinal epidural hematoma occurred in an older patient on anticoagulants after spinal manipulative therapy¹²³ and another case discussed anterior and posterior fixation of a cervical fracture induced by chiropractic spinal manipulation in an older patient with ankylosing spondylitis.¹²⁴

Case series (n = 2)

Zhang et al. reported on a retrospective case series involving 13 older patients (only two under age 55 years) with urinary incontinence (UI) who were treated using the Pro-Adjuster technique.¹²⁵ The patients all presented with spinal or leg complaints but divulged that they also had UI during their interviews. Patients were treated between 1 and 8 weeks. The primary outcome measure was frequency of nocturia, as recorded by the patient. All 13 patients reported improvements in their urination frequency after their treatment schedules, and two patients reported improvements after only 2 adjustments. Similarly positive results were reported by Hains et al.⁸

Doherty reported a case series involving 8 frail older women, ages 68–89 years old, all of whom had chronic obstructive lung disease.¹²⁶ Doherty treated these patients (1 man, 7 women) using spinal manipulative therapy, rib mobilization and/or instrumented adjusting over a 4 week period of time (total of 12 manipulative sessions provided). At each treatment, patients were asked to describe

any adverse events they experienced from the previous treatment session and to grade the severity of the adverse reaction on a pain visual analog scale (pain-VAS) from 0 (no pain) to 10 (worse pain imaginable). One patient did not report any adverse reactions at all. Among the other 7 patients, the number of adverse events ranges from 2 to 8 per patient over the course of care and these patients reported the severity of pain ranged from 2.0 to 5.9 on the pain-VAS. All the adverse reactions reported were mild transient events. None of the patients reported any serious adverse events over the course of therapy, such as fracture or significant bruising.

(d) Clinical Trials (n = 21)

Studies in this category were divided into two main groups: (i) Studies that describe clinical trials that have yet to be conducted ($n = 8$),^{127–134} and (ii) studies that provide the results of clinical trials that have been conducted ($n = 13$).^{135–147} Of those studies that have been completed, five did not involve the use of manual therapies^{135–139} whereas the other eight^{140–147} investigated the effects of manual therapies on older patients, one study using mobilization (administered by a physiotherapist)¹⁴⁰ and seven using manipulation administered by a chiropractor^{141–144} or an osteopath.^{145–147} To date, there have only been two randomized clinical trials involving chiropractic adjustments/manipulation and older patients.^{141,147}

Clinical Trials to be conducted (n = 8)

Eight studies were found that describe the recruitment, design, protocols or feasibilities of various interventions for older patients.^{127–134} Specifically, studies described future clinical trials involving older patients LBP only,¹²⁷ LBP or neck pain,¹²⁸ knee pain,¹²⁹ dizziness, neck pain and balance issues^{130–133} and pneumonia.¹³⁴

Completed clinical trials involving older patients not involving manual therapies (n = 5)

With respect to interventional studies not involving manual therapies, five studies were retrieved.^{135–139} Two of these studies^{135,136} were cross-sectional observational studies and the other three studies^{137–139} were interventional studies.

Uthaihpur and Jull reported that the cranial cervical flexion test, thought to test the coordination of the deep and superficial cervical flexor muscles, is altered in a group of

healthy asymptomatic elderly test subjects compared to a similar group of younger patients.¹³⁵ Another study by Champagne et al. reported that lumbopelvic muscle endurance and perceived exertion did not differ between two groups of healthy older and younger test subjects.¹³⁶

Haas et al. reported that a chronic disease self-management program had no advantages over a wait-list control group of older patients with chronic LBP with respect to improving pain, general health, self-efficacy and self-care attitudes, although there may have been some benefit with respect to patient's emotional well-being, fatigue, functional disability and days with disability.¹³⁷ Lorig et al. reported that Internet-based arthritis self-management program (ASMP) were a viable alternative to small group ASMP among a group of older patients with arthritis and fibromyalgia in terms of significant improvement in 4 of 6 health status measurements.¹³⁸ Lastly, Hess and Wollacott reported that high intensity strength-training targeting lower extremity muscles can be used safely and effectively in balance-impaired older patients, resulting in significant improvement in functional balance ability and decreased risk of falls, as monitored using the Berg Balance Scale, Timed Get and Go Test and Activities-Specific Balance Confidence Scale.¹³⁹

Completed clinical trials involving older patients involving manual therapies (n = 8)

A rather unique study was conducted by Bautmans et al. involving 15 older patients with severe dementia and dysphagia.¹⁴⁰ Trained physiotherapists administered cervical spine mobilization in a randomized controlled trial with cross-over. The control group consisted of socializing visits. The researchers reported that swallowing capacity improved significantly after cervical spine mobilization after one session and after one week of treatment.¹⁴⁰ No adverse effects were reported.

Seven studies^{141–147} monitored the effects of manipulation on older persons, four studies involving chiropractic manipulation and three studies involving osteopathic manipulation.

Hawk et al. described a study involving 81 older patients who were experiencing chronic musculoskeletal pain.¹⁴¹ One group was treated using BioEnergetic Synchronization Technique (BEST), a mind-body, non-manipulation light touch approach, along with verbal suggestions, group lectures, self-empowerment strategies

and lifestyle and nutritional modifications. This group was compared to a group of patients who received HVLA thrusting Diversified-style manipulations, in addition to modalities, soft tissue therapies, and advice on exercise and nutrition. For this study, outcome measures included Pain Disability Index (PDI), Beck Depression Inventory, clinicians' expectation of improvement, patients' expectation of improvement, time spent during intervention, and evaluation of clinic services. Treatment in both groups was provided over a four week period, and treatment sessions for patients in the BEST group lasted one to two hours whereas treatment sessions of patients receiving SMT lasted 10 to 15 minutes.¹⁴¹

At the end of the four week study, changes in the PDI for patients under BEST care was 6.9; for patients receiving Diversified care, PDI scores were on average 6.4. These differences were not statistically or clinically significant. However, it was interesting to read that *all* the doctors delivering BEST care *expected* all of their patients to completely recover whereas only two thirds of the Diversified doctors expected their patients to recover at all. This may speak to the impact the practitioner's expectation of patient's outcome has on the degree to which patients respond to care and the subsequent power of the clinical encounter, especially if it is augmented by positive expectations by both the doctor and patient.¹⁴¹

In 2009, Hawk et al. reported the results of a larger practice-based clinical trial investigating the effects of two different schedules of care compared to a schedule of no care, for a group of older patient with dizziness, balance difficulties and spinal pain.^{142,143} Specifically, 34 patients were enrolled in this study and divided into three different groups. Group 1 ($n = 13$) received a schedule of chiropractic care (described below) for 8 weeks, with 2 visits per week ("limited schedule"). Group 2 ($n = 15$) received chiropractic care for 8 weeks with 2 visits per week followed by 10 months with one visit per month (extended schedule). Chiropractic care consisted of spinal manipulative therapy (SMT, described as "Diversified technique"), including extravertebral manipulations of the hip, knee, ankle and foot, in addition to soft tissue therapy and the application of hot packs. In the event SMT was contraindicated, the practitioner substituted instrumented-adjusting or table-assisted procedures. The third group ($n = 6$) were only provided with brochures containing lifestyle advice and instructed to do home ex-

ercise. Although a number of factors were monitored in this study, the primary outcome measure was scoring as measured by the Berg Balance Scale (BBS).^{142,143}

Among those patients with dizziness, improvement on the BBS was demonstrated only among participants in both Group 1 and 2 of the study at 1 month and remained much lower than baseline throughout the study. This improvement was not seen among Group 3 participants. Moreover, pain as measured by the Pain Disability Index showed greater improvement from baseline to 1 year in Group 2 compared with the other groups. There were no treatment-related adverse effects reported.^{142,143}

Another randomized clinical trial compared two types of SMT to minimal conservative care for older adults 55 years and older with low back pain was conducted by Hondras et al.¹⁴⁴ In this study involving 240 participants (average age 63 years) subacute or chronic low back sufferers received either HVLA side-posture Diversified-style spinal manipulation or low velocity, variable-amplitude spinal manipulation, such as Cox-Flexion distraction technique. Patient responses from both intervention groups were compared to a group of patients who received minimal conservative care (control group). Participants in both intervention groups were scheduled to receive a maximum of 12 treatments at a frequency of no more than 3 times for the first two weeks and 2 times per week for the third and fourth week and once per week thereafter. Manipulation in both groups was restricted to between T12 and L5 spinal levels and the SI joints. Participants in the control group were given a 30-minute home exercise program.¹⁴⁴

At the end of the treatment sessions, the study team reported that both biomechanically distinct forms of spinal manipulation did not lead to different outcomes among older low back pain patients, and both forms of therapy were associated with small yet clinically important changes in functional status as compared to the control group. No adverse reactions were reporting during this study. The authors concluded that patient preference as well as clinical experience should drive how clinicians and patients determine which form of spinal manipulation to use for older patients with back pain.¹⁴⁴

Noll and his colleagues have published a number of articles chronically the effects of osteopathic manipulation on patients with pneumonia, three of which met the inclusion criteria of this study.¹⁴⁵⁻¹⁴⁷ The most recent arti-

cle, a randomized clinical trial involving 35 elderly (>65 years old) patients reported that the osteopathic manipulation group displayed a statistically significant decrease in forced expiratory flow at 25% and 50% of vital capacity and at midexpiratory phase, a decrease in expiratory reserve volume and airway resistance. In addition, this group of patients had a statistically significant improvement in residual volume and total lung capacity. Most subjects (82%) of patients receiving osteopathic manipulation reported "breathing easier." In their systematic review of manual therapies, Bronfort et al. concluded that "*there is inconclusive evidence in a favorable direction regarding the effectiveness of manual therapy for the treatment of acute pneumonia in elderly hospitalized patients.*"¹⁴⁸

(e) *Guidelines and Clinical Information (n = 55)*

General practice guidelines for chiropractic care planning for older patients (n = 42)

A number of articles by content experts have been published in the peer reviewed literature to assist practitioners with the appropriate case management of the myriad of health challenges that preferentially effect older patients. Schneider described the role of chiropractors in pain management for oncology patients,¹⁴⁹ Morley described recent advances in geriatric care from a medical perspective in 2001 in one article,¹⁵⁰ provided nutritional considerations of older people in another¹⁵¹ and Stump reviewed management of neuroarticular lesions on the elderly.¹⁵² Other articles have discussed, in general terms, the challenges practitioners confront when managing older patients,^{156,158,159,160,161} the importance of an integrated approach to manage these challenges^{153,154} and the advocacy for a wellness-based approach to health care.^{155,157,162}

One article specifically discussed the chiropractic management of foot problems¹⁶³ and four articles discussed the chiropractic management of disorders of the upper limb¹⁶⁴⁻¹⁶⁷ among older patients. Other articles discussed the chiropractic management of osteoporotic fractures,¹⁶⁸ the management of osteoarthritis and osteoporosis from a chiropractic perspective,¹⁶⁹ the role of chiropractic in managing patients with multiple sclerosis¹⁷⁰ the signs and symptoms of stroke¹⁷¹ and the benefits of exercise for older patients.¹⁷²

Eleven articles by chiropractic authors specifically dis-

cussed strategies to reduce falls (fall prevention) in the peer-reviewed literature.^{173–183} In addition, a national program in Canada for chiropractors targeting their older patients discussed fall prevention; a DVD containing risk factors, demographic information, assessment tools and management recommendations was mailed to all members of the Canadian Chiropractic Association in 2008.¹⁸⁴

Stuber et al.¹⁸⁵ reviewed the literature on the use of chiropractic for the treatment of lumbar spinal stenosis (LSS), a condition commonly affecting elderly patients. These reviewers were only able to find 6 articles that met their inclusion criteria (4 case reports, 1 case series and 1 observational cohort study). Despite this paucity of evidence, these reviewers concluded that the available evidence pointed towards chiropractic care (most often in the form of SMT or flexion-distraction manipulation) was potentially beneficial for patients with LSS.¹⁸⁵ Additionally, Kline recently authored two editorials that consisted of interviews of content experts who discuss the appropriate management of LSS.^{186,187}

Three articles have been written specifically on the topic of providing spinal manipulation/adjustments for older patients^{188–190} and the most current article found during this search was a Best Practice consensus document by Hawk et al.¹⁹¹ That Best Practice article used a Delphi process of over 30 content experts and provides an evidence-based approach to the assessment (history taking, physical examination, diagnostic imaging) and management (use of different chiropractic technique systems, care planning) of older patients, including issues of jurisprudence, safety and a list of absolute and relative contraindications to care.¹⁹¹

Workshops, Conference Platform & Other Chiropractic Geriatric References (n = 13)

A number of workshops and platform presentations have been provided at large international conferences between 2001 and 2010 on the topic of chiropractic care for older patients. Byfield,^{192–194} Doherty¹⁹⁵ and Sportelli¹⁹⁶ have provided important information on providing chiropractic care (specifically spinal adjusting) for older patients and Gleberzon^{197,198} and Freedman¹⁹⁹ provided platform presentation and a workshop on issues of quality of life for seniors (wellness, fall prevention and mental health).

Since 2001, there have been two textbooks pub-

lished specifically on the topic of chiropractic geriatric care,^{200,201} the “White House” brief, a submission on chiropractic care to Congress in the United States²⁰² and two textbook chapters on issues specific to older chiropractic patients.^{203,204}

Miscellaneous references

It would be remiss to not cite those references that, although not specific to chiropractic geriatric care, provide important information towards it. Important sources of information include Guidelines on fall prevention and pain management for older patients by the American Geriatric Society,^{205–207} the Report on Senior’s Falls in Canada by the Public Health Agency of Canada,²⁰⁸ two reports by the World Health Organization (WHO), one on “Active Ageing”²⁰⁹ and the other on falls prevention²¹⁰ and four reports from the Cochrane Collaboration on the topics of fall prevention,²¹¹ rehabilitation for older patients,²¹² exercise²¹³ and strength training²¹⁴ for improvement in balance and physical function.

Discussion

Compared to the review of the literature conducted in 2001² there has been a greater than threefold increase in the number of retrievable articles and references on geriatric chiropractic care of older persons (see Table 2). Specifically, the number of references pertaining to chiropractic geriatric education has increased from 3 to 11, the number of demographic and epidemiological studies has increased from 9 to 18, the number of case reports and case series has increased from 25 to 83, the number of clinical trials has increased from 4 to 21 (although four of these clinical trials investigated osteopathic rather than chiropractic manipulation) and the number of references on clinical guidelines and general clinical information for practitioners has increased from 18 to 55; this includes the publication of two textbooks that exclusively focus on chiropractic care for older patients.^{200,201} In total, then, there has been an increase in the number of published references in the chiropractic literature regarding older patients from 59 up to the year 2000 to 188 between 2001 and 2010.

That said, only two studies published in between 2001 and 2010 were randomized clinical trials which, despite their limitations, are still considered the “gold standard” of research evidence.¹⁴⁸ Despite this paucity of RCTs in the evidence base, Bronfort et al. concluded in their ex-

Table 2 Comparison of the number of references retrieved between a review of the literature published in 2001¹ and this review

| Type of Study | Number of studies found In 2001 review ¹ | Number of studies found during this review (c2010) |
|---|---|--|
| Chiropractic geriatric education | 3 | 11 |
| Demographic/ Epidemiological | 9 | 18 |
| Case studies/ series | 25 | 83 |
| Clinical trials | 4 | 21 |
| Guidelines and general clinical information | 18 | 55 |
| Total all studies | 59 | 188 |

tensive review of the literature of manual procedures that there is “*moderate quality evidence that spinal manipulation/mobilization is an effective treatment option for sub-acute and chronic LBP in older adults.*”^{148:p17}

From Evidence-Based to Best Practice to Patient-Centred Care

It bears repeating that “Best Practices” do not and should not rely solely on the results of RCTs or meta-analyses of these RCTs.^{215–218} Sackett was very clear in this regard when he first advocated for the Evidence-Based Medicine (EBM) movement in the late 1990s. His oft-quoted position was that:

“EBM means integrating individual clinical expertise with the best available external clinical evidence from systematic research ... By best available external clinical evidence, we mean clinically relevant research, often from the basic sciences of medicine, but especially from patient-centered clinical research. Without clinical expertise, practice risks becoming tyrannized by external evidence, for even excellent external evidence may be inapplicable to or inappropriate for an individual patient. Without current best external evidence, practice risks becoming rapidly out of date, to the detriment of patients.”^(215p1186)

Furthermore, during his testimony before an Inquest held in Ontario in 2004, when asked about relying only on evi-

dence to guide health care decisions, Sackett informed the jury that, while at Oxford, only 47% of medical procedures used for patient care had been proven effective and banning procedures not shown to be effective by randomized clinical trials “*would shut down the healthcare system,*” essentially grinding it to a screeching halt.²¹⁶

Echoing the sentiments by Mootz²¹⁹ who discussed the importance of both a molecular and contextual approach to patient care, with the utilization of both qualitative and quantitative outcome measures respectively as described by Bolton,²²⁰ Triano²¹⁸ reminded the reader that the “evidence-based” was never meant to be “evidence-entrained” and the elements of “context” that matter for clinical decision making include (i) the complexity of the case, (ii) best available evidence, (iii) practitioner’s expertise and experience and, (perhaps most importantly) (iv) patient preferences and beliefs.²¹⁸ These factors are important since RCTs can rarely be applied to individual patients since they attempt to “fit to the mean,” thus theoretically not taking into account the 50% of cases that deviate from the norm.²¹⁸ Elsewhere, Rosner has discussed the limitations of RCTs.²¹⁷ Meta-analyses present similarly problematic limitations, including (i) bias of the selection criteria of studies to be included for review, (ii) lack a standardized analyses and systematic method to validate new analysis methods and, (iii) poor consistency and/or accuracy of investigative reviewers during the application of criteria during the analysis.²¹⁸ Haynes and his colleagues may have captured this issue best when they wrote:

“Subsequent versions of evidence-based decision-making have emphasized that research evidence alone is never an adequate guide to action. Rather, clinicians must apply their expertise to assess patient’s problem, and must also incorporate the research evidence and the patient’s preference or values before making a management recommendation”^(221pA11)

Thus there seems to be emerging a new paradigm, one that can be termed “Patient-Centered Evidence-Based Health Care” which is constructed from an amalgam of patient preference, research evidence and clinical experience and can have as its rallying cry: “Evidence does not make decisions- people do.”^{221pA11}

Chiropractic care and adverse effects

With respect to safety, it would appear that spinal manipulative therapy can be safely provided for older patients, even the frail elderly.¹²⁶ Cassidy et al.²²² sought to investigate the association between chiropractic care and vertebrobasilar artery (VBA) stroke and to compare it the association between recent primary care physicians (PCP) care and VBA stroke, using an epidemiological design. Based on a review of all VBA stroke cases admitted to Ontario hospitals between 1993 and 2002 (mean age of patients 63 years), the researchers concluded that, firstly, VBA stroke is a very rare event with only 818 cases occurring in that time span and, secondarily patients over 45 years old were three times as likely to seek out a chiropractor or a PCP before experiencing a stroke. In other words, patient with headache or neck pain were just as likely to consult either a chiropractor or PCP before their stroke and there was no evidence of excess risk of VBA stroke associated with either chiropractic or medical care. In all likelihood, these patients were experiencing a stroke-in-progress and the care they sought did not exacerbate the stroke itself. A study of 280 patients (13% of whom were over the age of 60 years) reported most adverse effects related to chiropractic care were minor transient muscle soreness that typically resolved with 24 hours of its occurrence²²³ and a systematic review conducted in 2009 reported that most side effects associated with spinal manipulation are benign and transitory in nature, and the incidence of serious side effects is rare.²²⁴

Based on the most comprehensive review of the literature of the use of manual (principally manipulative)

therapies for older patients to date, Cooperstein and Killinger²²⁵ opined that not only do older patients not experience more injuries than do younger patients they may actually experience fewer. They attribute this observation to three possible factors: (i) greater prudence by the doctor who may either apply high velocity low amplitude (HVLA) thrusts with less pressure by using a broader surface area contact or the substitution of lower force procedures (instrumented adjusting, use of pelvic wedges or other low force techniques) or; (ii) greater joint stiffness of an older patient (including the absence of the disc nucleus with age) or; a combination of the two. Furthermore, with respect to optimum care planning, Cooperstein and Killinger suggest that practitioners, when confronted with a patient presenting with neck, shoulder or scapula pain consider the interconnectedness of these regions and examine all of them, even if a patient only expresses pain in only one of them. Common chief complaints that may only be ameliorated by addressing dysfunctions of this entire region include cervicogenic headaches, thoracic outlet symptoms and scapulocostal syndrome. Similarly, pain in the lumbothoracic region may originate from dysfunctions of the pelvic due to gait abnormalities, all of which respond to chiropractic intervention of some kind.²²⁵

In addition to there being a number of low force chiropractic technique systems that purportedly are safer for use for older patients (²²⁶ and see Table 3a), the use of HVLA spinal manipulative therapies has yet to be proven more harmful than low-force or no-force techniques and there are various strategies can be employed by practitioners to minimize any potential risk of harm. If a practitioner is confronted with a patient with mid-back back pain who is severely osteoporotic, rather than attempt to manipulate the patient in either the supine or prone position, during which a fracture could occur due to the compressive forces generated through the patient’s body, the clinician may choose to position the patient in either a side-lying or seated position (^{227,228} and see Table 3b). In that manner, the clinician could still provide a HVLA thrust on the clinical target with a greatly reduced fear of causing harm.²²⁷

Conclusion

“Evidence-based medicine is not kind to the elderly. This movement trusts only the products of randomized clinical trial or, preferentially, meta-analyses

Table 3a *List of non-HVLA chiropractic technique systems by that may be preferentially used for care of older patients*²²⁶

- Instrumented adjusting (i.e. Activator Methods Chiropractic, Atlas Orthogonal)
- Use of padded wedges (Sacro-Occipital Technique)
- Drop-piece table (i.e. Thompson Terminal Point)
- Mechanical mechanized tables (i.e. Cox Flexion-Distraktion)
- Low-Force techniques (i.e. BioEnergetic Synchronization, Network Spinal Analysis, Toftness, Logan Basic, Upper Cervical, Cranial techniques)

Table 3b *Recommendations to enhance patient safety of older patients judged to be at greater risk of injury during delivery of HVLA adjustments/manipulations*^{225,228}

- Increase surface area [thus decreasing net pressure (not force)] through the use of a more broad contact by doctor (flat hand rather than pisiform/hypothenar or thenar) on patient (contact more than one vertebral segment and avoid contacting spinous process or transverse processes)
- Preferentially position patient side-posture or seated to provide thoracic adjustments (thus avoiding compression of thoracic cage)
- Use drop pieces to reduce amount of force during delivery of prone HVLA spinal adjustments/manipulations

of those trials. But subjects over the age of 75 years are rarely found in such trials, thus rendering this population invisible to scientific medicine. If we teach only what we know, and if we know only what we can measure in clinical trials, then we can say little of importance about the care of the elderly. The most important resources required in caring for the old – sufficient time and empathy – are not included in the critical pathways of managed care^(229p1285)

The exponential accrual of the evidence base of chiropractic care for older patients is certainly encouraging and bodes well for the profession's future. That said, there is clearly a gap in the evidence base of chiropractic geriatric care, with the under-representation of clinical trials of all kinds at the forefront of this gap. Even so, this review found 188 retrievable articles available to practitioners to augment their clinical expertise in order to effective care plan for their older patients, a better than threefold increase from a similar review conducted at the end of the previous decade.

Over 20 years ago, the World Health Organization (WHO) defined health as “*a state of complete physical, social and mental wellbeing and not merely the absence of disease or infirmity*”²³⁰ and this resonates well with the holistic and biopsychosocial approach chiropractors champion with their patients with studies of all kinds indicating patient are very satisfied with the high-touch low-tech approach that is patient-focused.²³¹ Furthermore, as indicated by the increased focus of chiropractic care of older patients as evidenced by this review, the profession can align itself with the WHO's definition of “*disease prevention*” that “*covers measures not only to prevent the occurrence of disease, such as risk factors reduction, but also to arrest the progress and reduce its consequences once established*”²³⁰ and health promotion that “*is the process of enabling people to increase control over, and to improve, their health.*”²³²

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