
ORIGINAL ARTICLE

Essential literature for the chiropractic profession: *Results and implementation challenges from a survey of international chiropractic faculty*

Barbara A. Mansholt, DC, MS, Stacie A. Salsbury, PhD, RN, Lance G. Corber, MSITM, and John S. Stites, DC

Objective: Scientific literature applicable to chiropractic practice proliferates in quantity, quality, and source. Chiropractic is a worldwide profession and varies in scope between states or provinces and from country to country. It is logical to consider that the focus and emphasis of chiropractic education varies between programs as well. This original research study endeavored to determine “essential literature” recommended by chiropractic faculty. The purpose of this article is (1) to share our results and (2) to promote discussion and explore means for future collaboration of chiropractic faculty through a worldwide platform.

Methods: A 2-phase recruitment occurred initially at the institutional level and subsequently at the faculty level. A Web-based survey used qualitative data collection methods to gather bibliographic citations. Descriptive statistics were calculated for demographics, and citation responses were ranked per number of recommendations, grouped into categories, and tabulated per journal source and publication date.

Results: Forty-one chiropractic programs were contacted, resulting in 30 participating chiropractic programs (16 US and 14 international). Forty-five faculty members completed the entire survey, submitting 126 peer-reviewed publications and 25 additional citations. Readings emphasized clinical management of spine pain, the science of spinal manipulation, effectiveness of manual therapies, teaching of chiropractic techniques, outcomes assessments, and professional issues.

Conclusion: A systematic approach to surveying educators in international chiropractic institutions was accomplished. The results of the survey provide a list of essential literature for the chiropractic profession. We recommend establishing a chiropractic faculty registry for improved communication and collaboration.

Key Indexing Terms: Chiropractic; Education; Faculty; Internationality; Research; Survey and Questionnaires

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INTRODUCTION

The proliferation of the scientific literature poses a challenge to the clinician and educator who desires to be conversant in the research status of a profession. Our study aimed to develop a mechanism to identify and disseminate literature “essential” to the chiropractic profession.¹ Available research continues to grow at an astounding pace.² Literature affecting the practice of chiropractic is found in a wider variety of resources as research continues to evolve, as recently demonstrated in the American College of Physicians recent clinical guideline for acute, subacute, and chronic low back pain.³ The quality of research available also continues to improve through the editorial use of transparency instruments available through the EQUATOR Network, such as CONSORT, STROBE, PRISMA, CARE, STARD, and AGREE,⁴ and quality

database resources, such as Cochrane Collaboration⁵ and ClinicalTrials.gov.⁶

Chiropractic is a worldwide profession. In the United States, many chiropractic programs are private educational institutions and focused predominantly if not solely on the education of chiropractors and chiropractic staff. Internationally, chiropractic programs may exist independently or as part of a larger university system. Chiropractic practice varies in scope between states or provinces and from country to country. It is logical to consider that the focus and emphasis of chiropractic education, philosophy, and research varies between programs as well.

Our current students are the future leaders of our profession; we strive to know how they are molded. What we do not know, however, is whether how or when quality literature disperses through our educational system. Consequently, we wondered, what literature do chiroprac-

tic faculty deem “essential” for every chiropractor of which to be aware? The purpose of this study was to survey chiropractic faculty worldwide to determine what literature these faculty deem essential reading for chiropractors and chiropractic students. We share these results not only as a reference of teaching faculty “essential literature” but also to promote discussion and find ways for future collaboration of chiropractic faculty through a worldwide platform.

METHODS

We conducted an online, descriptive survey to understand what chiropractic program faculty consider to be essential reading for the chiropractic profession. The human protections administrator for Palmer College of Chiropractic determined that this study was exempt per 45 CFR 46, IRB Assurance # X2014-10-17-M. The survey was conducted from March through May 2015.

Recruitment

Participant recruitment occurred on 2 levels: chiropractic educational institutions and individual faculty members (Fig. 1). We first obtained a list of international and US ($n = 41$) chiropractic programs and their contact information from the World Federation of Chiropractic (WFC) (<http://www.wfc.org>). The detailed list included accreditation agency, country, school, department (if applicable), physical address, phone, fax, and general e-mail address, as well as a contact name with their professional designation, job title, and phone number, fax, and e-mail address. We e-mailed the designated representative from each chiropractic program requesting a procedure to acquire e-mail addresses for all faculty members in their program; 21 programs replied to this e-mail request. Personalized follow-up by phone call was necessary to determine appropriate channels for other institutions ($n = 4$). Several lists ($n = 5$) were obtained via hand retrieval of faculty listings from a program website. Human resources departments were also used as a source for obtaining e-mail contact information. In total, 30 of 41 chiropractic institutions participated in this study, with 11 chiropractic educational institutions (1 US, 10 international) not responding to requests for information. In addition to direct and indirect recruitment of chiropractic faculty, we also introduced the survey to prospective respondents via verbal announcements and handouts at the 2015 Association of Chiropractic Colleges Research Agenda Conference.

Survey Development and Implementation

We developed a Web-based survey in ASP.NET v4.0 in C# and Structured Query Language (SQL) using Microsoft Visual Studio 2010 (Microsoft Corporation, Redmond, WA). All data were stored on an internal Microsoft SQL Server 2014. The survey was pretested among chiropractic faculty at our home institution for clarity, ease of use, and content validity.

The survey was launched in March 2015. Recipients received a survey link, pass code, and cover letter with a

short explanation regarding the purpose and methods of the study via e-mail. Recipients received an e-mail and link either directly from our Web page/server (direct recipients) or from an individual designated from the program responsible for survey dissemination (indirect recipients). Direct recipients received up to 4 automated reminder messages, depending on their response status within the software. Institutional contacts for indirect recipients received up to 3 prompts to disseminate reminders to faculty.

The survey used qualitative data collection methods. Respondents listed the author, title, journal, and year of an article the respondent considered essential reading for chiropractors and chiropractic students and included a short statement indicating why the recommended article was important. Demographic data collected included respondents' age, gender, hours per week reading professional literature, years of teaching experience, chiropractic program affiliation, primary assignment (administration, classroom, clinical, research, or other), full-time or part-time status, whether a chiropractor or not (if yes, chiropractic program of training), highest degree achieved, and clinical practice status.

Data Analysis

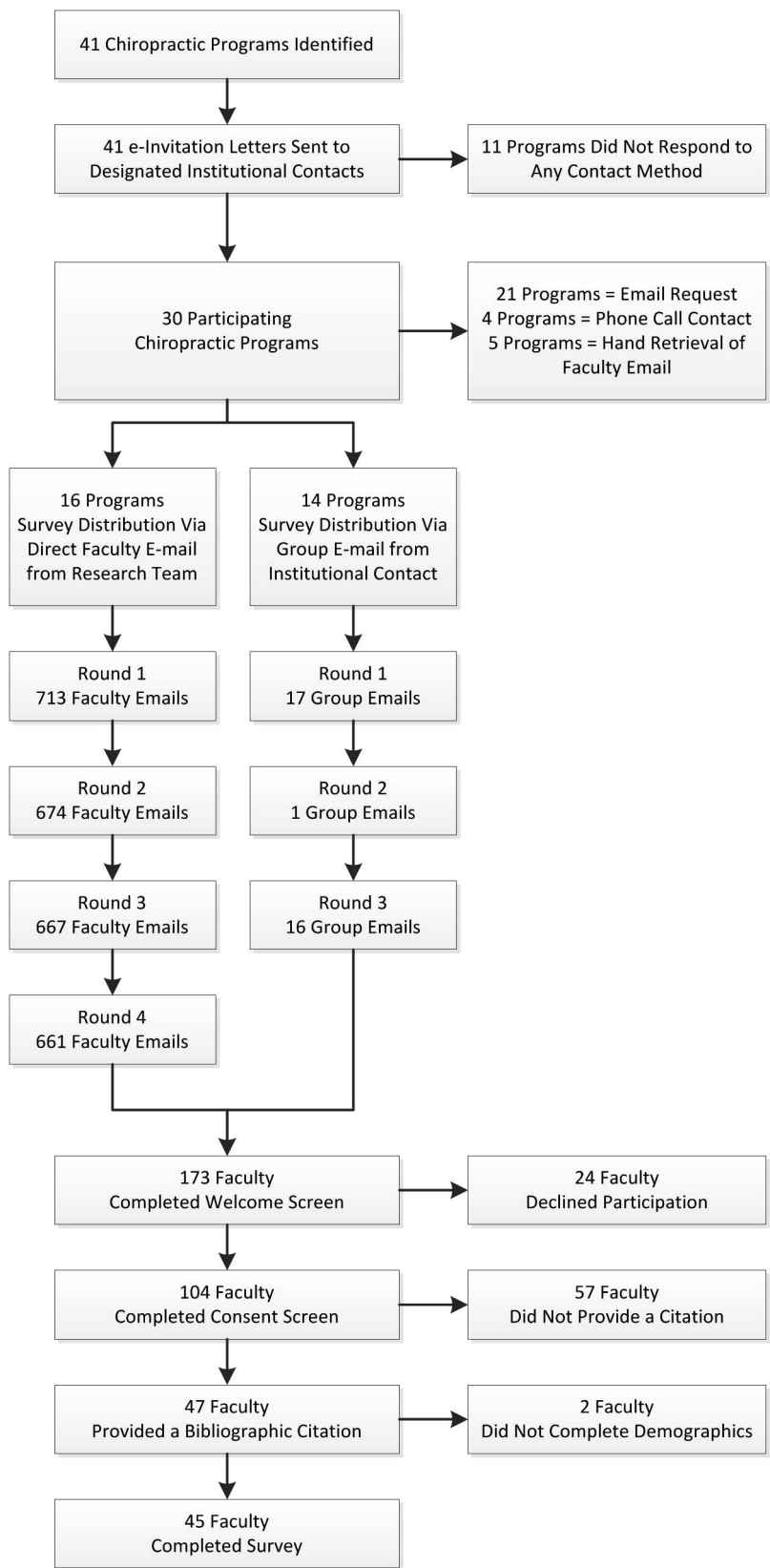
Descriptive statistics were calculated for demographics using SAS v9.4 (SAS Institute Inc, Cary, NC). Citations were ranked per number of recommendations, with the submission results divided into 2 categories: peer-reviewed and non-peer-reviewed publications. Further, submissions were tabulated per journal source and publication date.

RESULTS

Program Participation

We established a method of distribution with 16 of the 17 US chiropractic programs: 5 responded to the initial e-mail contact, 1 responded to a follow-up e-mail contact, 4 responded after contacting an individual known personally by 1 of the authors, 5 program faculty lists were obtained via hand retrieval from a program website, and 1 list was retrieved by contacting the program's human resources department. Of the US programs, 6 programs did not share faculty e-mail lists but agreed to distribute the survey via an e-mail to faculty members on our behalf. Five programs shared complete faculty e-mail lists. We manually retrieved e-mail lists from the websites of 5 additional US programs due to an absence of response after multiple attempts and approaches. One program was unresponsive to multiple e-mail requests to direct individuals, general Web inquiry, and voice mails left at human resources.

We established a method of distribution with 14 of 24 programs outside the United States: 9 responded to the initial email inquiry, 2 responded to follow-up inquiries, and 2 responded to inquiries submitted via Web inquiry or program website. Of those, 5 chiropractic program faculty received direct e-mails, while 9 programs agreed to forward the survey invitation to their faculty. The 11 chiropractic programs that did not participate were unresponsive to at least 2 e-mail requests to direct individuals as well as



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Figure 1 - Participant recruitment from chiropractic educational institutions and individual faculty members.



Figure 2 - Global map of chiropractic education institutions.

general Web inquiry. E-mails were primarily sent in English but also included duplicate text converted via Google Translate when appropriate. The authors chose not to attempt to communicate with human resource departments via phone in some cases due to time zone differences and potential language barriers.

The survey was e-mailed directly to 713 chiropractic program faculty members (108 international in 5 programs and 605 US in 10 programs) and indirectly to 14 programs worldwide (6 US and 9 international). Figure 2 shows a map of chiropractic program distribution worldwide.

Faculty Respondents

While 173 respondents completed the welcome screen and 24 declined participation, only 45 respondents completed the entire survey through the demographic information section; 47 respondents submitted articles. The response rate is not possible to compute due to the unknown distribution number, but we estimate that it is below 5%. The mean age of respondents was 50.2 (SD = 9.8) years, with the majority female ($n = 30$) and chiropractors ($n = 34$). Slightly over half were full-time ($n = 24$), with the average time teaching in a chiropractic program at 12.97 (SD = 10.6) years. Thirty reported formal training in an evidence-based practice within the past 5 years and spent an average of 7.2 (SD = 3.36) hours per week reading professional literature. Most respondents were involved in classroom instruction of clinical sciences ($n = 16$) or research ($n = 13$), with most nonengaged in

clinical practice ($n = 28$). Table 1 presents the remaining demographic information for the sample.

Article Citations

Respondents submitted a mean (SD, range) of 4.5 (2.5, 1–10) articles. One hundred and twenty-six peer-reviewed publications were submitted as essential literature for the chiropractic profession. Twenty-five submissions were non-peer reviewed in nature, 19 of which were published textbooks. Recommended articles were published in the *Journal of Manipulative and Physiological Therapeutics* ($n = 30$), *Spine* ($n = 14$), *The Spine Journal* ($n = 9$), *Chiropractic and Manual Therapy* ($n = 8$), *Journal of the Canadian Chiropractic Association* ($n = 7$), and a variety of other chiropractic, manual/physical therapy, and internal medicine journals. Publication years ranged from 1979 to 2015; most publication dates fell in the 2006–2010 ($n = 38$) and 2011–2015 ($n = 63$) ranges.

Table 2 reports the 126 peer-reviewed submissions. Citations are listed first by the number of recommendations by survey respondents and then alphabetically by title and author/citation. A quotation from the recommending respondents is provided demonstrating the importance of the article. Articles highlighted in gray are available currently on the *WFC Suggested Reading List for Chiropractic* (accessed May 18, 2017).

Table 3 reports the 25 non-peer-reviewed submissions, listed first by number of recommendations and then

Table 1 - Respondent Demographics of the Chiropractic Faculty Survey

| Characteristic | n |
|---|----|
| Formal training in evidence-based clinical practice in 5 years? | |
| Yes | 30 |
| No | 14 |
| Chiropractic program affiliation | |
| Barcelona College of Chiropractic, Spain | 2 |
| Canadian Memorial Chiropractic College, Canada | 4 |
| Life Chiropractic College West, USA | 1 |
| Logan College of Chiropractic, USA | 3 |
| McTimoney College of Chiropractic, UK | 1 |
| Murdoch University, Australia | 2 |
| National University of Health Sciences, USA | 5 |
| New York College of Chiropractic, USA | 2 |
| New Zealand College of Chiropractic, New Zealand | 2 |
| Northwestern Health Sciences University, USA | 2 |
| Palmer College of Chiropractic, USA (Iowa) | 10 |
| Palmer College of Chiropractic, USA (California) | 1 |
| Parker University, USA | 1 |
| University of Bridgeport, USA | 4 |
| University of Southern Denmark, Denmark | 3 |
| University of Western States, USA | 1 |
| Primary assignment | |
| Administration | 2 |
| Classroom: basic sciences | 7 |
| Classroom: clinical sciences | 16 |
| Clinical instruction: patient care | 2 |
| Research | 13 |
| Other | 4 |
| Chiropractic education | |
| Anglo-European College of Chiropractic, UK | 0 |
| Barcelona College of Chiropractic, Spain | 1 |
| Canadian Memorial Chiropractic College, Canada | 5 |
| Centro Universitario Feevale, Brazil | 0 |
| Cleveland Chiropractic College, USA | 1 |
| Cleveland Chiropractic College, USA (California) | 0 |
| D'Youville College, USA | 0 |
| Durban University of Technology, South Africa | 0 |
| Hanseu University, Republic of Korea | 0 |
| Institut Franco-Européen de Chiropratique, France | 0 |
| International Medical University, Malaysia | 0 |
| Life Chiropractic College West, USA | 0 |
| Life University, USA | 0 |
| Logan College of Chiropractic, USA | 5 |
| Macquarie University, Australia | 0 |
| McTimoney College of Chiropractic, UK | 1 |
| Murdoch University, Australia | 0 |
| Murdoch University International Study Centre, Japan | 0 |
| National University of Health Sciences, USA | 5 |
| National University of Health Sciences, USA (Florida) | 0 |
| New York College of Chiropractic, USA | 4 |
| New Zealand College of Chiropractic, New Zealand | 1 |
| Northwestern Health Sciences University, USA | 2 |
| Palmer College of Chiropractic, USA (Iowa) | 9 |
| Palmer College of Chiropractic, USA (West) | 1 |
| Palmer College of Chiropractic, USA (Florida) | 0 |
| Parker University, USA | 1 |
| Real Centro Universitario Escorial-Maria Cristina, Spain | 0 |
| RMIT University, Australia | 2 |

Table 1 - Continued.

| Characteristic | n |
|--|----|
| Sherman College of Straight Chiropractic, USA | 0 |
| Skandinaviska Kiropraktorhögskolan, Sweden | 0 |
| Southern California University of Health Sciences, USA | 0 |
| Texas Chiropractic College, USA | 1 |
| Tokyo College of Chiropractic, Japan | 0 |
| Universidad Estatal del Valle de Ecatepec, Mexico | 0 |
| Universidade Anhembi Morumbi, Brazil | 0 |
| Université du Québec à Trois-Rivières, Canada | 0 |
| University of Bridgeport, USA | 0 |
| University of Glamorgan, The Welsh Institute of Chiropractic, UK | 0 |
| University of Johannesburg, South Africa | 0 |
| University of Southern Denmark, Denmark | 0 |
| University of Western States, USA | 0 |
| University of Zurich, Switzerland | 0 |
| Other | 0 |
| Degrees earned (mark all that apply) | |
| BS or BA | 33 |
| MA, MS, MPH | 23 |
| Academic doctorate (PhD or EdD) | 10 |
| Chiropractic degree (DC or equivalent) | 35 |
| Other clinical doctorate (DO, MD) | 1 |
| Other | 5 |

alphabetically by title and author/publisher or source, also with a quotation from the recommending respondent.

Literature With Multiple Recommendations

Eighteen peer-reviewed articles and 1 textbook received multiple recommendations. An article by Cassidy and colleagues, “Risk of vertebrobasilar stroke and chiropractic care: results of a population-based case control and case-crossover study,” received 11 submissions as essential literature for chiropractors.⁷ Second in ranking was Bronfort et al,⁸ “Effectiveness of manual therapies: the UK evidence report.” Five articles received 3 recommendations: “A theoretical model for the development of a diagnosis-based clinical decision rule for the management of patients with spinal pain” (Murphy⁹), “Clinical effectiveness of manual therapy for the management of musculoskeletal and non-musculoskeletal conditions: a systematic review and update of the UK evidence report” (Clar et al¹⁰), “Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American College of Physicians and the American Pain Society” (Chou et al³), “Dose-response and efficacy of spinal manipulation for care of chronic low back pain: a randomized controlled trial” (Haas et al¹¹), and “Review of methods used by chiropractors to determine the site for applying manipulation” (Triano et al¹²).

Twelve additional submissions (11 peer-reviewed articles and 1 book) were recommended twice. Of the articles, 1 was regarding chiropractic and stroke,¹³ 5 regarding basic science,¹⁴⁻¹⁸ and 5 regarding clinical management of spine pain.¹⁹⁻²³ The textbook submitted twice was that of Murphy.²⁴

Table 2 - Peer-Reviewed Publications (Submissions if > 1)^a

| Citation | Comments |
|---|--|
| Cassidy JD, Boyle E, Côté P, et al. Risk of vertebrasilar stroke and chiropractic care: results of a population-based case-control and case-crossover study. <i>Spine (Phila Pa 1976)</i> . 2008;33(4 suppl):S176–S183. ¹¹ | a key paper . . . an important study on an important topic educating the scientific community on the safety of spinal manipulation . . . understand risk of vertebrasilar accidents. . . . Issue of stroke and causation and helps refute . . . best evidence about association between cervical SMT and VAD and stroke . . . best studies examining the safety of chiropractic . . . demonstrates that people experience strokes after seeing both primary care providers and chiropractors with similar incidence. |
| Bronfort G, Haas M, Evans R, Leininger B, Triano J. Effectiveness of manual therapies: the UK evidence report. <i>Chiropr Osteopat</i> . 2010;18:3. ⁶ | well done overview of the evidence base for the vast majority of chiropractic conditions . . . provides a concise look. . . . Illustrates recent evidence for and against . . . great primer on where evidence exists, and just as importantly, where it is lacking. |
| Murphy DR, Hurwitz EL. A theoretical model for the development of a diagnosis-based clinical decision rule for the management of patients with spinal pain. <i>BMC Musculoskelet Disord</i> . 2007;8:75. ³ | Well documented evidence informed approach to managing low back pain patients. . . . Introduces a classification system and treatment pathway to guide assessment and treatment. |
| Clar C, Tsertsvadze A, Court R, Hundt GL, Clarke A, Sutcliffe P. Clinical effectiveness of manual therapy for the management of musculoskeletal and non-musculoskeletal conditions: systematic review and update of UK evidence report. <i>Chiropr Man Therap</i> . 2014;22(1):12. ³ | reviews the evidence for effectiveness of manual methods for a broad scope of conditions. . . . Important update to UK Evidence Report . . . contemporary evidence summary. |
| Chou R, Qaseem A, Snow V, et al. Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American College of Physicians and the American Pain Society. <i>Ann Intern Med</i> . 2007;147(7):478–491. ³ | Essential medical guideline formulated by mainstream medicine investigators that includes chiropractic medicine management in recommendations for the treatment of low back pain . . . it remains the most comprehensive set of recommendations. |
| Haas M, Vavrek D, Peterson D, Polissar N, Neradilek MB. Dose-response and efficacy of spinal manipulation for care of chronic low back pain: a randomized controlled trial. <i>Spine J</i> . 2014;14(7):1106–1116. ³ | continues the conversation/adds to the research surrounding the question of how many treatments (approximately) should be rendered for certain musculoskeletal conditions . . . latest in dose-response papers, all of which are vital to giving appropriate treatment scheduling. |
| Triano JJ, Budgell B, Bagnulo A, et al. Review of methods used by chiropractors to determine the site for applying manipulation. <i>Chiropr Man Therap</i> . 2013;21(1):36. ³ | excellent summary full of practice knowledge . . . how do we determine where to adjust the patient . . . helps inform the profession of methods [which] have poor success or reliability . . . most up to date and comprehensive review on this topic. |
| Baker G, Farabaugh R, Augat TJ, Hawk C. Algorithms for the chiropractic management of acute and chronic spine-related pain. <i>Top Integr Heal Care</i> . 2012;3(4). ² | Evidenced based guidelines for the management of spine related pain with chiropractic care. |
| Vining R, Potocki E, Seidman M, Morgenthal AP. An evidence-based diagnostic classification system for low back pain. <i>J Can Chiropr Assoc</i> . 2013;57(3):189–204. ² | a useful guide to help clinicians identify an evidence-based, specific diagnosis for a low back condition. It also highlights the need for a working diagnosis to try to accomplish ethical, efficient and successful management of a patient with LBP. |
| Cramer G, Budgell B, Henderson C, Khalsa P, Pickar J. Basic science research related to chiropractic spinal adjusting: the state of the art and recommendations revisited. <i>J Manipulative Physiol Ther</i> . 2006;29(9):726–761. | Overview of mechanisms/basic science related to spinal manipulation. |
| Tuchin P. Chiropractic and stroke: association or causation? <i>Int J Clin Pract</i> . 2013;67(9):825–833. ² | Excellent overview, discussion and evidence base on stroke. Critical for DC reading . . . good analysis of the causative agents [of] stroke. |
| Maiers M, Bronfort G, Evans R, et al. Spinal manipulative therapy and exercise for seniors with chronic neck pain. <i>Spine J</i> . 2014 ;14(9):1879–1889. ² | an update to our knowledge and current theories of chiropractic mechanisms of action . . . numerical results are complimented by patient experiences . . . via structured interviews. |

Table 2 - Continued.

| Citation | Comments |
|--|---|
| Pickar JG, Bolton PS. Spinal manipulative therapy and somatosensory activation. <i>J Electromyogr Kinesiol.</i> 2012;22(5):785–794.² | <i>Provides an update to our knowledge and current theories of chiropractic mechanisms of action.</i> |
| Rubinstein SM, Terwee CB, Assendelft WJJ, de Boer MR, van Tulder MW. Spinal manipulative therapy for acute low back pain: an update of the cochrane review. <i>Spine (Phila Pa 1976).</i> 2013;38(3):E158–E177. ² | <i>Core information for chiropractors . . . should be obvious.</i> |
| Herzog W. The biomechanics of spinal manipulation. <i>J Bodyw Mov Ther.</i> 2010;14(3):280–286.² | <i>easy to understand summary of the biomechanical characteristics of spinal manipulation.</i> |
| Haldeman S, Carroll L, Cassidy JD, Schubert J, Nygren A. The Bone and Joint Decade 2000–2010 Task Force on Neck Pain and Its Associated Disorders: executive summary. <i>Spine (Phila Pa 1976).</i> 2008;33(4 suppl):S5–S7. ² | <i>Teaching aide for clinic. . . . We need more high quality best-evidence synthesis [like this summary]. . . . Synopsis of the . . . risk and prognostic factors.</i> |
| Bialosky JE, Bishop MD, Price DD, Robinson ME, George SZ. The mechanisms of manual therapy in the treatment of musculoskeletal pain: a comprehensive model. <i>Man Ther.</i> 2009;14(5):531–538. ² | <i>Provides a comprehensive model of manual therapies and how they affect peripheral and central mechanisms. It is not restricted to manipulation but many in the profession do soft-tissue work and non-thrust techniques that would fall under these proposed mechanisms.</i> |
| Cramer GD, Henderson CNR, Little JW, Daley C, Grieve TJ. Zygapophyseal joint adhesions after induced hypomobility. <i>J Manipulative Physiol Ther.</i> 2010;33(7):508–518.² | <i>physical proof that hypo-mobile joints can result in physical tissue changes . . . important in documenting and justifying chiropractic manipulation. . . . Animal model showing the risk of spinal immobility.</i> |
| Flynn T, Fritz J, Whitman J, et al. A clinical prediction rule for classifying patients with low back pain who demonstrate short-term improvement with spinal manipulation. <i>Spine (Phila Pa 1976).</i> 2002;27(24):2835–2843. | <i>increase the likelihood of identifying those who benefit the most from SMT.</i> |
| Murphy DR, Hurwitz EL, Nelson CF. A diagnosis-based clinical decision rule for spinal pain part 2: review of the literature. <i>Chiropr Osteopat.</i> 2008;16:7. | <i>Diagnosis is important.</i> |
| Panjabi MM. A hypothesis of chronic back pain: ligament subfailure injuries lead to muscle control dysfunction. <i>Eur Spine J.</i> 2005;15(5):668–676. | <i>A clear depiction of exactly the “thing” chiropractors are seeking out and treating in patients. A great “picture” of chronic subluxation and the effects it has on a body.</i> |
| Kaminski M, Boal R, Gillette RG, Peterson DH, Villnave TJ. A model for the evaluation of chiropractic methods. <i>J Manipulative Physiol Ther.</i> 1987;10(2):61–64. | <i>Seminal paper on evaluating chiropractic methods. An early-bird. Many papers followed.</i> |
| Murphy DR, Hurwitz EL, Gregory A, Clary R. A nonsurgical approach to the management of patients with cervical radiculopathy: a prospective observational cohort study. <i>J Manipulative Physiol Ther.</i> 2006;29(4):279–287. | <i>clinical significance; cohort study rather than individual case report.</i> |
| Haneline M. A primer on evidence-based practice for chiropractors. <i>Chiropr J Aust.</i> 2011;41(3):78. | <i>Great overview of evidence based practice.</i> |
| Clement RC, Welander A, Stowell C, et al. A proposed set of metrics for standardized outcome reporting in the management of low back pain. <i>Acta Orthop.</i> 2015:1–11. | <i>these tools not only assist in treatment goals, plans, and expectations but help to justify treatment to payers.</i> |
| George JW, Skaggs CD, Thompson PA, Nelson DM, Gavard JA, Gross GA. A randomized controlled trial comparing a multimodal intervention and standard obstetrics care for low back and pelvic pain in pregnancy. <i>Am J Obstet Gynecol.</i> 2013;208(4):295.e1–e7. | <i>illustrates indication of superior outcomes with multi-modal care (which includes chiropractic management) for pregnancy related low back pain.</i> |
| Leaver AM, Maher CG, Herbert RD, et al. A randomized controlled trial comparing manipulation with mobilization for recent onset neck pain. <i>Arch Phys Med Rehabil.</i> 2010;91(9):1313–1318. | <i>More proof for the effectiveness of chiropractic, this time with neck pain. Also, this article shows effectiveness of varying techniques since not all patients are candidates for HVLA manipulation.</i> |
| Enix DE, Sudkamp K, Malmstrom TK, Flahert JH. A randomized controlled trial of chiropractic compared to physical therapy for chronic low back pain in community dwelling geriatric patients. <i>Top Integr Health Care.</i> 2015;6(1). | <i>chiropractic care is as good or better than physical therapy for elderly patients with chronic low back pain.</i> |

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Table 2 - Continued.

| Citation | Comments |
|--|--|
| Carnes D, Mars TS, Mullinger B, Froud R, Underwood M. Adverse events and manual therapy: a systematic review. <i>Man Ther.</i> 2010;15(4):355–363. | <i>a large sample size and concludes that the adverse effects of manual care are infrequent.</i> |
| Daligadu J, Haavik H, Yielder PC, Baarbe J, Murphy B. Alterations in cortical and cerebellar motor processing in subclinical neck pain patients following spinal manipulation. <i>J Manipulative Physiol Ther.</i> 2013;36(8):527–537. | <i>documents important CNS responses to the chiropractic adjustment.</i> |
| Kaminski M, Boal R. An effect of ascorbic acid on delayed-onset muscle soreness. <i>Pain.</i> 1992;50(3):317–321. | <i>First paper from the chiropractic profession to appear in this prestigious international journal.</i> |
| Koes BW, van Tulder M, Lin C-WC, Macedo LG, McAuley J, Maher C. An updated overview of clinical guidelines for the management of non-specific low back pain in primary care. <i>Eur Spine J.</i> 2010;19(12):2075–2094. | <i>N/A</i> |
| Albert HB, Sorensen JS, Christensen BS, Manniche C. Antibiotic treatment in patients with chronic low back pain and vertebral bone edema (Modic type 1 changes): a double-blind randomized clinical controlled trial of efficacy. <i>Eur Spine J.</i> 2013;22(4):697–707. | <i>New treatment options in chronic low back pain.</i> |
| Murphy DR, Hurwitz EL. Application of a diagnosis-based clinical decision guide in patients with low back pain. <i>Chiropr Man Therap.</i> 2011;19:26. | <i>demonstrates how [diagnosis-based clinical decision guide] is done in a practice setting.</i> |
| Croft A. Appropriateness of cervical spine manipulation in disc herniation: a survey of practitioners. <i>Chiropr Tech.</i> 1996;8(4):178–181. | <i>clinical significance; survey data from 3,510 practitioners.</i> |
| Giuliano DA, McGregor M. Assessment of a generalizable methodology to assess learning from manikin-based simulation technology. <i>J Chiropr Educ.</i> 2014;28(1):16–20. | <i>new education tool being used in the chiropractic community.</i> |
| Koppenhaver SL, Fritz JM, Hebert JJ, et al. Association between changes in abdominal and lumbar multifidus muscle thickness and clinical improvement after spinal manipulation. <i>J Orthop Sports Phys Ther.</i> 2011;41(6):389–399. | <i>second of a series of three papers [regarding] biomechanical mechanisms of SMT.</i> |
| Koppenhaver SL, Fritz JM, Hebert JJ, et al. Association between history and physical examination factors and change in lumbar multifidus muscle thickness after spinal manipulation in patients with low back pain. <i>J Electromyogr Kinesiol.</i> 2012;22(5):724–731. | <i>preliminary evidence of the biomechanical mechanisms of SMT.</i> |
| Bakris G, Dickholtz M, Meyer PM, et al. Atlas vertebra realignment and achievement of arterial pressure goal in hypertensive patients: a pilot study. <i>J Hum Hypertens.</i> 2007;21(5):347–352. | <i>Alternative treatment of hypertension with a chiropractic technique.</i> |
| Triano JJ. Biomechanics of spinal manipulative therapy. <i>Spine J.</i> 2001;1(2):121–130. | <i>first and most scientifically and clinically articulate description of biomechanics related to spinal manipulation.</i> |
| Haldeman S, Rubinstein SM. Cauda equina syndrome in patients undergoing manipulation of the lumbar spine. <i>Spine (Phila Pa 1976).</i> 1992;17(12):1469–1473. | <i>Provides data related to the actual low risk of CES related to lumbar manipulation.</i> |
| Carrick FR. Changes in brain function after manipulation of the cervical spine. <i>J Manipulative Physiol Ther.</i> 1997;20(8):529–545. | <i>identifies a quick, and easy method of evaluation of brain hemisphericity.</i> |
| Niazi IK, Türker KS, Flavel S, Kinget M, Duehr J, Haavik H. Changes in H-reflex and V-waves following spinal manipulation. <i>Exp Brain Res.</i> 2015;233(4):1165–1173. | <i>suggests chiropractic care increases cortical drive and reduces fatigue.</i> |
| Coronado RA, Gay CW, Bialosky JE, Carnaby GD, Bishop MD, George SZ. Changes in pain sensitivity following spinal manipulation: a systematic review and meta-analysis. <i>J Electromyogr Kinesiol.</i> 2012;22(5):752–767. | <i>N/A</i> |
| Nelson CF, Lawrence DJ, Triano JJ, et al. Chiropractic as spine care: a model for the profession. <i>Chiropr Osteopat.</i> 2005;13:9. | <i>our profession can gain cultural authority and impact for the benefit of society.</i> |

Table 2 - Continued.

| Citation | Comments |
|---|---|
| Cotton BA. Chiropractic care of a 47-year-old woman with chronic Bell's palsy: a case study. <i>J Chiropr Med</i> . 2011;10(4):288–293. | <i>Bell's palsy neurological disorder with chiropractic treatment.</i> |
| Triano JJ, Goertz C, Weeks J, et al. Chiropractic in North America: toward a strategic plan for professional renewal—outcomes from the 2006 Chiropractic Strategic Planning Conference. <i>J Manipulative Physiol Ther</i> . 2010;33(5):395–405. | <i>Essential reading for any chiropractor regarding our role in society.</i> |
| Kinsinger FS, Sutton W. Chiropractic leadership in the eradication of sexual abuse. <i>J Can Chiropr Assoc</i>. 2012;56(1):66–74. | <i>advocating for patient primacy and safety with a four-stage proactive approach to deal with a current and ongoing problem in health care.</i> |
| Meeker WC, Haldeman S. Chiropractic: a profession at the crossroads of mainstream and alternative medicine. <i>Ann Intern Med</i>. 2002;136(3):216–227. | <i>An insightful . . . overview of the chiropractic profession and its uncomfortable fit between complementary medicine (which largely funds its research) and mainstream healthcare.</i> |
| Huggins T, Boras AL, Gleberzon BJ, Popescu M, Bahry LA. Clinical effectiveness of the activator adjusting instrument in the management of musculoskeletal disorders: a systematic review of the literature. <i>J Can Chiropr Assoc</i> . 2012;56(1):49–57. | <i>Great to have a named chiropractic technique that has a systematic review of the literature—a rare thing in our profession.</i> |
| Ammendolia C, Chow N. Clinical outcomes for neurogenic claudication using a multimodal program for lumbar spinal stenosis: a retrospective study. <i>J Manipulative Physiol Ther</i>. 2015;38(3):188–194. | <i>discusses neurogenic claudication and how it relates to degenerative lumbar spinal stenosis.</i> |
| Wong JJ, Côté P, Shearer HM, et al. Clinical practice guidelines for the management of conditions related to traffic collisions: a systematic review by the OPTIMa Collaboration. <i>Disabil Rehabil</i>. 2015;37(6):471–489. | <i>A timely overview of variance in clinical guidelines re: whiplash and WAD.</i> |
| Walker BF, French SD, Grant W, Green S. Combined chiropractic interventions for low-back pain. <i>Cochrane Database Syst Rev</i> . 2010;(4):CD005427. | <i>combined chiropractic interventions show slight improvements in pain and disability in the short-term for acute and sub-acute low back pain.</i> |
| Standaert CJ, Friedly J, Erwin MW, Lee MJ, Rechting G, Henrikson NB, Norvell DC. Comparative effectiveness of exercise, acupuncture, and spinal manipulation for low back pain. <i>Spine (Phila Pa 1976)</i> . 2011;36(21 suppl):S120–S130. | <i>Comparative effectiveness trial for common CAM treatments which lends us a nice place in a multidisciplinary setting.</i> |
| Hill JC, Whitehurst DGT, Lewis M, et al. Comparison of stratified primary care management for low back pain with current best practice (STarT Back): a randomised controlled trial. <i>Lancet</i>. 2011;378(9802):1560–1571. | <i>Good example of the principle of stratified care in an musculoskeletal condition.</i> |
| Cleland JA, Fritz JM, Kulig K, et al. Comparison of the effectiveness of three manual physical therapy techniques in a subgroup of patients with low back pain who satisfy a clinical prediction rule: a randomized clinical trial. <i>Spine (Phila Pa 1976)</i> . 2009;34(25):2720–2729. | <i>shows that 2 types of thrust manipulation performed better than non-thrust manipulation.</i> |
| Dehen MD, Whalen WM, Farabaugh RJ, Hawk C. Consensus terminology for stages of care: acute, chronic, recurrent, and wellness. <i>J Manipulative Physiol Ther</i> . 2010;33(6):458–463. | <i>Terminology that can transcend all disciplines is important when communicating with other professionals.</i> |
| Hancock MJ, Koes B, Ostelo R, Peul W. Diagnostic accuracy of the clinical examination in identifying the level of herniation in patients with sciatica. <i>Spine (Phila Pa 1976)</i> . 2011;36(11):E712–E719. | <i>LBP clinicians do [this] very frequently.</i> |
| Bussi eres AE, Peterson C, Taylor JAM. Diagnostic imaging practice guidelines for musculoskeletal complaints in adults—an evidence-based approach: introduction. <i>J Manipulative Physiol Ther</i> . 2008;30(9):617–683. | <i>Excellent review of decision making.</i> |
| McGregor M, Puhl AA, Reinhart C, Injeyan HS, Soave D. Differentiating intraprofessional attitudes toward paradigms in health care delivery among chiropractic factions: results from a randomly sampled survey. <i>BMC Complement Altern Med</i> . 2014;14:51. | <i>provides insight into the divisions of the profession and their relative size.</i> |

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Table 2 - Continued.

| Citation | Comments |
|---|---|
| Cox JM, Feller JA, Cox JA. Distraction chiropractic adjusting: clinical application and outcomes of 1,000 cases. <i>Top Clin Chiropr.</i> 1996;3(3):45–59, 79–81. | <i>clinical significance; pooled outcome data from numerous practitioners providing outcome data for 1,000 cases.</i> |
| Senna MK, Machaly SA. Does maintained spinal manipulation therapy for chronic nonspecific low back pain result in better long-term outcome? <i>Spine (Phila Pa 1976)</i>. 2011;36(18):1427–1437. | <i>A recent RCT of maintenance care.</i> |
| Haas M, Spegman A, Peterson D, Aickin M, Vavrek D. Dose response and efficacy of spinal manipulation for chronic cervicogenic headache: a pilot randomized controlled trial. <i>Spine J</i>. 2010;10(2):117–128. | <i>Useful evidence summary.</i> |
| Blanchette MA, Bussi eres A, Stochkendahl MJ, Boruff J, Harrison P. Effectiveness and economic evaluation of chiropractic care for the treatment of low back pain: a systematic review protocol. <i>Syst Rev.</i> 2015;18(4):30. | <i>an evaluation of the effectiveness of chiropractic manipulation for low back pain.</i> |
| Roy RA, Boucher JP, Comtois AS. Effects of a manually assisted mechanical force on cutaneous temperature. <i>J Manipulative Physiol Ther.</i> 2008;31(3):230–236. | <i>demonstrated a clear connection between the chiropractic thrust and the physiologic alteration in the body . . . asymptomatic patients . . . [showing] signs of effect of treatment on factors other than pain.</i> |
| Lehman GJ, Vernon H, McGill SM. Effects of a mechanical pain stimulus on erector spinae activity before and after a spinal manipulation in patients with back pain: a preliminary investigation. <i>J Manipulative Physiol Ther.</i> 2001;24(6):402–406. | <i>SMT has a number of effects . . . changes to paraspinal muscles is an important effect to understand.</i> |
| Kinsinger S, Soave D. Ethics education in chiropractic colleges: a North American survey. <i>J Manipulative Physiol Ther.</i> 2012;35(6):486–490. | <i>Excellent overview of the diversity of ethics content at CCE colleges revealing a troubling lack of continuity.</i> |
| Cramer GD, Ross K, Pocius J, et al. Evaluating the relationship among cavitation, zygapophyseal joint gapping, and spinal manipulation: an exploratory case series. <i>J Manipulative Physiol Ther.</i> 2011;34(1):2–14. | <i>Understanding what happens when a facet joint cavitates . . . the joint gaps, releases gas (temporarily) and returns to the original joint position.</i> |
| Bryans R, Descarreaux M, Duranleau M, et al. Evidence-based guidelines for the chiropractic treatment of adults with headache. <i>J Manipulative Physiol Ther.</i> 2011;34(5):274–289. | <i>Guidelines represent an evidence synthesis and a starting place for care decisions.</i> |
| Bryans R, Decina P, Descarreaux M, et al. Evidence-based guidelines for the chiropractic treatment of adults with neck pain. <i>J Manipulative Physiol Ther.</i> 2014;37(1):42–63. | <i>Guidelines represent evidence synthesis and provide a framework for making care decisions.</i> |
| Maeda Y, Kettner N, Holden J, et al. Functional deficits in carpal tunnel syndrome reflect reorganization of primary somatosensory cortex. <i>Brain.</i> 2014;137(pt 6):1741–1752. | <i>the first paper to utilize functional brain imaging to demonstrate maladaptive neuroplasticity of the somatosensory cortex was underlying sensory and motor functional disturbances in the median nerve innervated digits of carpal tunnel syndrome.</i> |
| Murphy DR, Schneider MJ, Seaman DR, Perle SM, Nelson CF. How can chiropractic become a respected mainstream profession? The example of podiatry. <i>Chiropr Osteopat.</i> 2008;16:10. | <i>A road map for a positive chiropractic future.</i> |
| Kawchuk GN, Carrasco A, Beecher G, Goertzen D, Prasad N. Identification of spinal tissues loaded by manual therapy: a robot-based serial dissection technique applied in porcine motion segments. <i>Spine (Phila Pa 1976)</i>. 2010;35(22):1983–1990. | <i>identifies the spinal tissue loaded during SMT.</i> |
| Tait MJ, Levy J, Nowell M, et al. Improved outcome after lumbar microdiscectomy in patients shown their excised disc fragments: a prospective, double blind, randomised, controlled trial. <i>J Neurol Neurosurg Psychiatry.</i> 2009;80(9):1044–1046. | <i>highlights the psychological aspects of chronic pain.</i> |

Table 2 - Continued.

| Citation | Comments |
|---|--|
| Anderson B, Pitsinger A. Improvement in chronic muscle fasciculations with dietary change: a suspected case of gluten neuropathy. <i>J Chiropr Med</i> . 2014;13(3):188–191. | <i>nutrition is . . . important in musculoskeletal or neuromuscular conditions as pain management.</i> |
| Winterbottom M, Boon H, Mior S, Facey M. Informed consent for chiropractic care: comparing patients' perceptions to the legal perspective. <i>Man Ther</i> . 2015;20(3):463–468. | <i>models an excellent practice of [informed consent].</i> |
| Skyba DA, Radhakrishnan R, Rohlwing JJ, Wright A, Sluka KA. Joint manipulation reduces hyperalgesia by activation of monoamine receptors but not opioid or GABA receptors in the spinal cord. <i>Pain</i> . 2003;106(1–2):159–168. | <i>attempts to determine the mechanism behind the analgesic effects of SMT.</i> |
| Deyo RA, Jarvik JG, Chou R. Low back pain in primary care. <i>BMJ</i>. 2014;349:g4266. | <i>A good evidence summary to promote the rational use of imaging.</i> |
| Farabaugh RJ, Dehen MD, Hawk C. Management of chronic spine-related conditions: consensus recommendations of a multidisciplinary panel. <i>J Manipulative Physiol Ther</i> . 2010;33(7):484–492. | <i>reference management ideas from a multidisciplinary panel (and perhaps compare/contrast their own strategies).</i> |
| McGregor M, Giuliano D. Manikin-based clinical simulation in chiropractic education. <i>J Chiropr Educ</i> . 2012;26(1):14–23. | <i>First article published by a chiropractic institution using manikin-based simulation technology for teaching purposes.</i> |
| Murphy DR, Hurwitz EL, Gregory AA. Manipulation in the presence of cervical spinal cord compression: a case series. <i>J Manipulative Physiol Ther</i> . 2006;29(3):236–244. | <i>N/A</i> |
| Gross A, Miller J, D'Sylva J, et al. Manipulation or mobilisation for neck pain: a Cochrane Review. <i>Man Ther</i>. 2010;15(4):315–333. | <i>Useful evidence summary.</i> |
| Llusá M, Meri À, Ruano D, eds. <i>Manual y atlas fotográfico de anatomía del aparato locomotor</i> . Buenos Aires: Editorial Médica Panamericana; 2004. | <i>It's a great specific atlas of locomotor anatomy.</i> |
| Nathan M, Keller TS. Measurement and analysis of the in vivo posteroanterior impulse response of the human thoracolumbar spine: a feasibility study. <i>J Manipulative Physiol Ther</i> . 1994;17(7):431–441. | <i>Demonstrates bone movement in response to a chiropractic mechanically-assisted thrust—using a fraction of the force required to move a bone with a manual thrust.</i> |
| Hayden JA, van Tulder MW, Malmivaara AV, Koes BW. Meta-analysis: exercise therapy for nonspecific low back pain. <i>Ann Intern Med</i>. 2005;142(9):765–775. | <i>A classic summary of the effects of exercises.</i> |
| Pickar JG. Neurophysiological effects of spinal manipulation. <i>Spine J</i>. 2002;2(5):357–371. | <i>Good overview of mechanisms and suspected mechanisms of spinal manipulation.</i> |
| De Witt JK, Osterbauer PJ, Stelmach GE, Fuhr AW. Optoelectric measurement of changes in leg length inequality resulting from isolation tests. <i>J Manipulative Physiol Ther</i> . 1994;17(8):530–538. | <i>Crucial piece of literature for backing what we “see” when doing leg length analysis.</i> |
| Peterson CK, Schmid C, Leemann S, Anklin B, Humphreys BK. Outcomes from magnetic resonance imaging-confirmed symptomatic cervical disk herniation patients treated with high-velocity, low-amplitude spinal manipulative therapy: a prospective cohort study with 3-month follow-up. <i>J Manipulative Physiol Ther</i>. 2013;36(8):461–467. | <i>information about positive clinical outcomes.</i> |
| Goertz CM, Pohlman KA, Vining RD, Brantingham JW, Long CR. Patient-centered outcomes of high-velocity, low-amplitude spinal manipulation for low back pain: a systematic review. <i>J Electromyogr Kinesiol</i> . 2012;22(5):670–691. | <i>N/A</i> |
| Bialosky JE, Bishop MD, George SZ, Robinson ME. Placebo response to manual therapy: something out of nothing? <i>J Man Manipulative Ther</i> . 2011;19(1):11–19. | <i>N/A</i> |

Table 2 - Continued.

| Citation | Comments |
|---|---|
| Fritz JM, Koppenhaver SL, Kawchuk GN, Teyhen DS, Hebert JJ, Childs JD. Preliminary investigation of the mechanisms underlying the effects of manipulation: exploration of a multivariate model including spinal stiffness, multifidus recruitment, and clinical findings. <i>Spine (Phila Pa 1976)</i>. 2011;36(21):1772–1181. | <i>first of a series of three papers that present preliminary evidence of the biomechanical mechanisms of SMT.</i> |
| Gatterman MI, Cooperstein R, Lantz C, Perle SM, Schneider MJ. Rating specific chiropractic technique procedures for common low back conditions. <i>J Manipulative Physiol Ther</i> . 2001;24(7):449–456. | <i>provides data indicating the need especially for further investigation of chiropractic effectiveness relative to low back disorders with associated neurologic symptomatology and neurologic findings in lower extremity.</i> |
| Kawchuk GN, Fryer J, Jaremko JL, Zeng H, Rowe L, Thompson R. Real-time visualization of joint cavitation. <i>PLoS One</i>. 2015;10(4):e0119470. | <i>helps explain the popping sound when a chiropractic adjustment is rendered.</i> |
| Downie A, Williams CM, Henschke N, et al. Red flags to screen for malignancy and fracture in patients with low back pain: systematic review. <i>BMJ</i>. 2013;347:f7095. | <i>Core information for chiropractic clinicians.</i> |
| Whedon JM, Song Y, Mackenzie TA, Phillips RB, Lukovits TG, Lurie JD. Risk of stroke after chiropractic spinal manipulation in Medicare B beneficiaries aged 66 to 99 years with neck pain. <i>J Manipulative Physiol Ther</i>. 2015;38(2):93–101. | <i>the issue of stroke and causation.</i> |
| Dagenais S, Brady O, Haldeman S. Shared decision making through informed consent in chiropractic management of low back pain. <i>J Manipulative Physiol Ther</i> . 2012;35(3):216–226. | <i>It has had an important impact on the informed consent that is used in our clinic and others.</i> |
| Napadow V, Liu J, Li M, et al. Somatosensory cortical plasticity in carpal tunnel syndrome treated by acupuncture. <i>Hum Brain Mapp</i> . 2007;28(3):159–171. | <i>functional brain imaging to demonstrate abnormal cortical neuroplastic organization in carpal tunnel patients could be normalized with treatment consisting of sensory mechanoreceptor conditioning using acupuncture stimuli applied to points in the forearm.</i> |
| Mangum K, Partna L, Vavrek D. Spinal manipulation for the treatment of hypertension: a systematic qualitative literature review. <i>J Manipulative Physiol Ther</i> . 2012;35(3):235–243. | <i>that most research studies of spinal manipulation for high blood pressure have a high risk of bias calling into question the findings of such studies.</i> |
| Song X-J, Gan Q, Cao J-L, Wang Z-B, Rupert RL. Spinal manipulation reduces pain and hyperalgesia after lumbar intervertebral foramen inflammation in the rat. <i>J Manipulative Physiol Ther</i> . 2006;29(1):5–13. | <i>informs about how radicular symptoms and signs may be due to inflammation in the absence of disc herniation physical compression of the spinal nerve; informs about the potential of spinal manipulation to reduce inflammation as the cause of patient symptoms and signs of radiculopathy.</i> |
| Bronfort G, Evans R, Anderson AV, Svendsen KH, Bracha Y, Grimm RH. Spinal manipulation, medication, or home exercise with advice for acute and subacute neck pain: a randomized trial. <i>Ann Intern Med</i>. 2012;156:1–10. | <i>Spinal manipulation beat out medication for acute and sub-acute neck pain, but home exercise with advice worked, too. What should neck pain patients do?</i> |
| Bronfort G. Spinal manipulation: current state of research and its indications. <i>Neurol Clin</i> . 1999;17(1):91–111. | <i>Evidence based summary of efficacy.</i> |
| Rubinstein SM, van Middelkoop M, Assendelft WJ, de Boer MR, van Tulder MW. Spinal manipulative therapy for chronic low-back pain: an update of a Cochrane review. <i>Spine (Phila Pa 1976)</i>. 2011;36(13):E825–E846. | <i>most patients see chiropractors for LBP and most deliver SMT.</i> |
| Delitto A, Piva SR, Moore CG, et al. Surgery versus nonsurgical treatment of lumbar spinal stenosis: a randomized trial. <i>Ann Intern Med</i> . 2015;162(7):465–473. | <i>This is the most convincing data to support a non-surgical approach to obviate an emerging epidemic of spinal pain.</i> |
| Dagenais S, Tricco AC, Haldeman S. Synthesis of recommendations for the assessment and management of low back pain from recent clinical practice guidelines. <i>Spine J</i>. 2010;10(6):514–529. | <i>Guidelines include the appropriate use of evidenced based multidisciplinary methods.</i> |

Table 2 - Continued.

| Citation | Comments |
|--|---|
| <p>Foster NE, Hartvigsen J, Croft PR. Taking responsibility for the early assessment and treatment of patients with musculoskeletal pain: a review and critical analysis. <i>Arthritis Res Ther.</i> 2012;14(1):205.</p> | <p><i>chiropractors can take on more responsibility as a mainstream health care provider and the evidence for that being a good thing.</i></p> |
| <p>Khalsa PS, Eberhart A, Cotler A, Nahin R. The 2005 conference on the biology of manual therapies. <i>J Manipulative Physiol Ther.</i> 2006;29(5):341–346.</p> | <p><i>This conference was a watershed event in the history of chiropractic research. It was 30 years since the original NIH funded conference on manual therapy and this modern event accelerated and disseminated NIH/NCCAM funding opportunities.</i></p> |
| <p>Enix DE, Scali F, Pontell ME. The cervical myodural bridge, a review of literature and clinical implications. <i>J Can Chiropr Assoc.</i> 2014;58(2):184–192.</p> | <p><i>This recent discovery of two new myodural bridges connecting the sub-occipital muscles with the dura mater of the cervical spine provides additional rational for the treatment of tension headaches with chiropractic care.</i></p> |
| <p>Bishop PB, Quon JA, Fisher CG, Dvorak MFS. The Chiropractic Hospital-Based Interventions Research Outcomes (CHIRO) study: a randomized controlled trial on the effectiveness of clinical practice guidelines in the medical and chiropractic management of patients with acute mechanical low back pain. <i>Spine J.</i> 2010;10(12):1055–1064.</p> | <p><i>demonstrated that clinical guideline-based chiropractic achieved greater improvement in condition-specific function than those receiving usual care.</i></p> |
| <p>Bussi eres A, Stuber KJ. The Clinical Practice Guideline Initiative: a joint collaboration designed to improve the quality of care delivered by doctors of chiropractic. <i>Can Chiropr Assoc.</i> 2013;57(4):279–284.</p> | <p><i>Provides evidence-based treatment alternatives for WAD injuries.</i></p> |
| <p>Weigel PA, Hockenberry J, Bentler SE, Wolinsky FD. The comparative effect of episodes of chiropractic and medical treatment on the health of older adults. <i>J Manipulative Physiol Ther.</i> 2014;37(3):143–154.</p> | <p><i>chiropractic use for uncomplicated back problems may have a protective effect against declines in activities of daily living in older persons—food for thought!</i></p> |
| <p>Basbaum AI, Levine JD. The contribution of the nervous system to inflammation and inflammatory disease. <i>Can J Physiol Pharmacol.</i> 1991;69(5):647–651.</p> | <p><i>rational for treating inflammatory conditions of extremities with spinal manipulation along with inflammation reducing modalities and supplements.</i></p> |
| <p>Marshall P, Murphy B. The effect of sacroiliac joint manipulation on feed-forward activation times of the deep abdominal musculature. <i>J Manipulative Physiol Ther.</i> 2006;29(3):196–202.</p> | <p><i>it shows an immediate, presumably beneficial effect of a chiropractic adjustment on feed forward activation in asymptomatic individuals. This suggests chiropractic care can enhance motor control even when no pain is present.</i></p> |
| <p>Holt KR, Haavik H, Elley CR. The effects of manual therapy on balance and falls: a systematic review. <i>J Manipulative Physiol Ther.</i> 2012;35(3):227–234.</p> | <p><i>establishes that more research is required in this important topic and sets the stage for a study to follow.</i></p> |
| <p>Cramer GD, Gregerson DM, Knudsen JT, Hubbard BB, Ustas LM, Cantu JA. The effects of side-posture positioning and spinal adjusting on the lumbar Z joints: a randomized controlled trial with sixty-four subjects. <i>Spine (Phila Pa 1976).</i> 2002;27(22):2459–2466.</p> | <p><i>Important study on effects of side posture manipulation.</i></p> |
| <p>Good CJ. The great subluxation debate: a centrist’s perspective. <i>J Chiropr Humanit.</i> 2010;17(1):33–39.</p> | <p><i>Explains the controversy that exists in regards to topic.</i></p> |
| <p>da C Menezes Costa L, Maher CG, Hancock MJ, McAuley JH, Herbert RD, Costa LOP. The prognosis of acute and persistent low-back pain: a meta-analysis. <i>CMAJ.</i> 2012;184(11):E613–E624.</p> | <p><i>Prognostic information is increasingly recognised as being as important as diagnostic information, especially in conditions with high diagnostic uncertainty.</i></p> |
| <p>Haavik H, Murphy B. The role of spinal manipulation in addressing disordered sensorimotor integration and altered motor control. <i>J Electromyogr Kinesiol.</i> 2012;22(5):768–776.</p> | <p><i>a good summary of the literature relevant to the effects of SMT on sensorimotor integration which I think is very important when it comes to our understanding of the mechanisms of action of chiropractic care.</i></p> |
| <p>Korr IM. The spinal cord as organizer of disease processes: II. The peripheral autonomic nervous system. <i>J Am Osteopath Assoc.</i> 1979;79(2):82–90.</p> | <p><i>States in detail how upregulation of SNS is unhealthy.</i></p> |
| <p>Batti  MC, Videman T, Kaprio J, et al. The Twin Spine Study: contributions to a changing view of disc degeneration. <i>Spine J.</i> 2009;9(1):47–59.</p> | <p><i>traditional risk factors associated with low back pain are not supported.</i></p> |

Table 2 - Continued.

| Citation | Comments |
|---|---|
| Francio VT, Boesch R, Tunning M. Treatment of a patient with posterior cortical atrophy (PCA) with chiropractic manipulation and Dynamic Neuromuscular Stabilization (DNS): A case report. <i>J Can Chiropr Assoc.</i> 2015;59(1):37–45. | <i>demonstrating the chiropractic is not just for the spine or muscular problems.</i> |
| Hurwitz EL, Carragee EJ, van der Velde G, et al. Treatment of neck pain: noninvasive interventions: results of the Bone and Joint Decade 2000–2010 Task Force on Neck Pain and Its Associated Disorders. <i>Spine (Phila Pa 1976).</i> 2008;33(4 suppl):S123–S152. | <i>this is a key study from the last decade.</i> |
| Eisenberg DM, Davis RB, Ettner SL, et al. Trends in alternative medicine use in the United States, 1990–1997: results of a follow-up national survey. <i>JAMA.</i> 1998;280(18):1569–1575. | <i>Medicine became aware of the use of alternative medicine and the need for integrative medicine.</i> |
| Rodine RJ, Aker P. Trigeminal neuralgia and chiropractic care: a case report. <i>J Can Chiropr Assoc.</i> 2010;54(3):177–186. | <i>neurology disorder with chiropractic treatment.</i> |
| UK BEAM Trial Team. United Kingdom back pain exercise and manipulation (UK BEAM) randomised trial: effectiveness of physical treatments for back pain in primary care. <i>BMJ.</i> 2004;11;329(7479):1377. | <i>Excellent demonstration of combined therapy which should be the standard for the profession.</i> |
| Hartman SE. Why do ineffective treatments seem helpful? A brief review. <i>Chiropr Osteopat.</i> 2009;17:10. | <i>Explains many of the misconceptions practitioners have about responses to care.</i> |
| Vos T, Flaxman AD, Naghavi M, et al. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. <i>Lancet.</i> 2012;380(9859):2163–2196. | <i>Musculoskeletal diseases, including low back pain and neck pain, are among the conditions contributing to years lived with disability worldwide.</i> |

^a Studies in bold are available on the *WFC Suggested Reading List for Chiropractic* as of May 18, 2017.

Peer-Reviewed Literature With Single Recommendations

The predominance of submissions primarily referenced clinically applicable topics, including treatment of neck/back pain/headaches, diagnostic accuracy, specific case studies, and treatment of certain populations.^{21,25–73} Many articles considered essential addressed basic science issues, such as mechanisms, biomechanics, chemical effects, and other investigations.^{29,74–99} There were several educationally themed submissions regarding ethics, consensus terminology, attitudes, and learning techniques.^{100–109} Another theme was a significant amount of clinical decision-making or guideline-based treatment topics.^{70,110–118} Several submissions regarded profession-wide issues, including future direction and the subluxation debate, and others regarded current state of research and profession-wide policies.^{119–127}

Non-Peer-Reviewed Literature With Single Recommendations

Nine textbooks were recommended encompassing clinical examination,^{128,129} decision making/management,^{130–132} or technique/treatment^{133–136} of and by chiropractors. Six textbooks were recommended, including evidence-based clinical practice,¹³⁷ neurobiologic mechanisms,¹³⁸ biomedical ethics,¹³⁹ biochemistry,¹⁴⁰ a single-volume anatomy atlas,¹⁴¹ and 2 regarding immunology.^{142,143} Five submissions in this category were summaries or overviews.^{144,145} Three submissions were compilations

available through governmental process or distribution.^{146–148}

Comparison of Essential Literature Findings to WFC Suggested Reading List

Articles highlighted in Table 2 identify readings common to the *Essential Literature for Chiropractic: International Faculty* survey and the *WFC Suggested Reading List*. Forty-five (36%) of the readings were shared by both lists. Among the *Essential Literature* readings not included in the WFC offerings, many recommendations were for articles that would guide the thinking of novice chiropractic practitioners. For example, chiropractic faculty recommended 13 papers on key clinical trials or observational studies on chiropractic, spinal manipulation, or manual therapy techniques.^{25,29,32,34,44,60,62,64,65,72} These teachers cited numerous articles ($n = 9$) on clinical decision making, such as classification systems, algorithms, or clinical prediction rules.^{9,19,42,51,70,102,110,111,149} Recent systematic reviews, clinical guidelines, and best practices related to conservative care of musculoskeletal conditions also garnered many endorsements ($n = 9$).^{37,39,47,109,114,115,118,150,151} Faculty also suggested articles on clinical assessment or training methods ($n = 7$), case studies ($n = 4$), outcomes assessment ($n = 3$), and adverse events ($n = 3$). Other common topics included those on models or mechanisms of pathology or interventions ($n = 14$) as well as professional issues or debates ($n = 11$).

Qualitative Comments to the Survey

Some respondents included qualitative comments in their responses to the survey. Several who declined participation stated they were not chiropractors or that they taught nonchiropractic courses, such as business. This response contrasted with the survey invitation, which was open to all chiropractic program faculty regardless of their training as chiropractors or the types of classes they taught. Others declined, as they considered themselves administrators or researchers rather than faculty members. Several other declines noted that they were not up to date with chiropractic professional literature, stating, “I can’t think of 3” or “not something I do regularly.” Other nonrespondents noted that they had declined participation but received another request or were concerned that there was not information about how the survey would be used and that “what is essential today might be outdated next year.” Finally, 1 respondent suggested that the time and effort of this survey was redundant to a program under development through the WFC for a suggested reading list for chiropractic.

DISCUSSION

This survey of international chiropractic program faculty was a follow-up evaluation from a survey of chiropractic research leaders on the essential literature for the chiropractic profession. We made a concerted effort to reach faculty members in all chiropractic educational programs ($n = 41$) listed on the WFC Web page; however, only 47 respondents from 16 chiropractic programs submitted citations. While the estimated response rate (<5%) was disappointing, and much lower than is typical of surveys of chiropractors,¹⁵² those who participated provided thoughtful responses, resulting in a lengthier list than our previous survey.¹ The greater response rate from female faculty is unexpected. We suspect that chiropractic faculty worldwide is not represented by more females than males—particularly a 3:1 ratio—although these statistics are not readily known. An online study of faculty in 2008 showed a response rate of females 12% higher than males.¹⁵³ Although we cannot speculate regarding the percentage of respondents, this is an interesting correlation. Note also that respondents are primarily from “classroom: clinical sciences” and “research.”

The results of the survey provide a useful resource for clinicians, educators, and students and provide a list for essential reading, and should be considered a complement to the *WFC Suggested Reading List for Chiropractic*, an online resource inspired by our initial survey of *Essential Literature for the Chiropractic Profession* and first published as this current survey was in its implementation stage. Essential readings with numerous recommendations from multiple participants included the management of low back pain and neck pain, basic science and biomechanical investigations of spinal manipulation, the effectiveness of manual therapy interventions, teaching and application of chiropractic techniques, outcomes assessment, and professional issues for chiropractic. Interestingly, our comparison of the *Essential Literature*

and the *WFC Suggested Reading List* found important gaps in topics of interest to chiropractic faculty. Indeed, 64% of *Essential Literature* articles were not included on the *Reading List*, such as those on chiropractic education or clinical prediction rules. Chiropractic faculty in this survey also recommended many recent articles not added to *WFC Suggested Reading List* (although some may have been disseminated through the “This Week’s Papers” function of the website). *Reading List* curators may bear our findings in mind when updating articles to ensure that the offerings are useful not only for readers well versed in the chiropractic literature who might be seeking new information but also for students, novice clinicians, and chiropractic faculty who require access to foundational works.

Most of the recommended peer-reviewed literature included studies high in strength of research or generalizability/applicability (systematic reviews, clinical trials, consensus panels, and so on). A few lower-level-evidence pieces (e.g., case studies and case series) were recommended. Conflict may arise regarding whether lower-level evidence may be considered “essential.” While the rationale for choosing case studies over other, higher levels of evidence is not known, some respondents may consider case reports “essential” due to the uniqueness of the case or for the lessons they offer chiropractic students who are learning to recognize common clinical presentations and diagnose complex health conditions. Chiropractic faculty members are encouraged to frame case studies within the context of the level of evidence they provide and to train students to seek information from systematic reviews and randomized clinical trials whenever these are available.¹³⁷

The challenges we encountered while implementing this survey may be of similar concern for researchers attempting to conduct studies with chiropractic faculty both in the United States and internationally. We discovered that there is no established, reliable, and current mechanism for communicating with faculty members across chiropractic programs. The WFC was efficient and responsive in sharing contact information. However, we had difficulty reaching several institutions either because the contact was not current or because the school officials did not respond to our requests for information. When chiropractic institutions did not reply to our requests, we attempted to gather faculty contact information directly from the educational institution’s website. However, the chiropractor faculty and departments at some educational institutions were not identifiable on the designated website. While this may be understandable in some instances, we found some nonresponse (to phone calls or e-mails) somewhat unexpected from an academic institution. Of more concern is that prospective and current chiropractic students may not have access to up-to-date background or contact information about their faculty members, nor is the composition of the faculty at some chiropractic institutions transparent to those outside their organizations.

Table 3 - Non-Peer-Reviewed Publications^a

| Title/Author/Publisher (Submissions if > 1) | Comments |
|--|---|
| Murphy, DR. <i>Clinical Reasoning in Spine Pain. Volume I: Primary Management of Low Back Disorders Using the CRISP Protocols</i> . Pawtucket, RI: CRISP Education and Research, LLC; 2013. | A current, updated and evidence-based textbook on primary care management of low back disorders. . . . This book presents a reasonable, evidence based approach to the treatment of spine related disorders likely to present to a DC's office. |
| Agency for Health Care Policy and Research.– Foreword. In Cherkin DC, Mootz RD, eds. <i>Chiropractic in the United States: Training, Practice, and Research</i> . Rockville, MD: Agency for Health Care Policy and Research; April 1998. | Another classic . . . referred to for statistics and other data. |
| Gatterman MI. <i>Chiropractic Management of Spine Related Disorders</i> . Philadelphia, PA: Lippincott Williams & Wilkins; 2003. | A practical well written book that cover most of what new (and existing) chiropractors should know . . . about good chiropractic and related interventions. |
| Epstein O, Perkin G, Cookson J, Watt I, Rakhit R, Robins AHG. <i>Clinical Examination</i> . 4th ed. Amsterdam: Elsevier; 2008. | For helping in identifying basic clinical situations. |
| Terrett AGJ. <i>Current Concepts in Vertebrobasilar Complications Following Spinal Manipulation</i> . 2nd ed. Clive, IA: NCMIC; 2001. | Another classic. |
| Triano J, Giuliano D, McGregor M, Howard L. <i>Enhanced Learning of Manipulation Techniques Using Force-Sensing Table Technology (FSTT)</i> . Toronto: Higher Education Quality Council of Ontario; 2014. http://www.heqco.ca/SiteCollectionDocuments/CMCC_Triano_report.pdf . Accessed July 21, 2015. | One of the first published pieces of literature on work using force-sensing table technology to train students in manual skills. |
| McCroy DC, Penzien DB, Hasselblad V, Gray RN. Evidence report: behavioral and physical treatments for tension-type and cervicogenic headache. http://www.chiro.org/LINKS/FULL/Behavioral_and_Physical_Treatments_for_Headache.html . Accessed July 8, 2015. | Another classic that is referred to. |
| Coico R, Sunshine G. <i>Immunology: A Short Course</i> . 6th ed. New York, NY: John Wiley & Sons, Inc; 2009. | N/A |
| Owen JA, Punt J, Stranford SA. <i>Kuby Immunology</i> . 7th ed. New York, NY: WH Freeman and Company; 2013. | N/A |
| Radsourc, Longitudinal stress fracture. http://radsourc.us/longitudinal-stress-fracture . Accessed July 8, 2015. | The article discusses a longitudinal stress fracture of the tibia, symptoms, imaging findings, cause, imaging pitfalls, etc. |
| Cleland JA, Koppenhaver S. <i>Netter's Orthopaedic Clinical Examination: An Evidence-Based Approach</i> . 2nd ed. Philadelphia, PA: WB Saunders; 2011. | Crucial clinical information and approach to it. |
| National Board of Chiropractic Examiners. Practice analysis of chiropractic 2015. http://www.nbce.org/practiceanalysis . | One of the few organizations that attempts to collect statistics on the chiropractic profession. |
| Haldeman S. <i>Principles and Practices of Chiropractic</i> . 3rd ed. New York, NY: McGraw-Hill; 2004. | Although the last edition is 10 years old, it is still an essential textbook for our profession. |
| Beauchamp T. <i>Principles of Biomedical Ethics</i>. New York, NY: Oxford University Press; 2012. | This is THE foundational scholarly resource from two of the founding academics in modern bioethics. This book is comprehensive and goes beyond a strict chiropractic paradigm. |
| Liebenson C. <i>Rehabilitation of the Spine: A Practitioner's Manual</i> . Philadelphia, PA: Lippincott Williams & Wilkins; 2006. | A rich historical and contemporary integrative approach to Chiropractic interventions. |
| Putz R, Pabst R, eds. <i>Sobotta—Atlas of Human Anatomy: Head, Neck, Upper Limb, Thorax, Abdomen, Pelvis, Lower Limb</i> . 14th ed. Munich: Elsevier; 2008. | a great anatomy general atlas. |
| Deyo RA, Dworkin SF, Amtmann D, et al. Report of the NIH task force on research standards for chronic low back pain. <i>Spine J</i> . 2014;14(8):1375–1391. | N/A |
| Cooperstein R, Gleberzon BJ. <i>Technique Systems in Chiropractic</i> . Churchill Livingstone; 2004. | All chiropractors should read this book. It brings together the history and development of chiropractic techniques in a unbiased manner using a systematic approach. |

Table 3 - Continued.

| Title/Author/Publisher (Submissions if > 1) | Comments |
|--|---|
| Vasudevan DM, Sreekumari S, Vaidyanathan K. <i>Textbook of Biochemistry for Medical Students</i> . 7th ed. New Delhi: Jaypee Brothers Medical Publishers Ltd; 2013. | N/A |
| Leach RA. <i>The Chiropractic Theories: A Textbook of Scientific Research</i> . Philadelphia, PA: Lippincott Williams & Wilkins; 2004. | describes the subluxation theories and the evidence base for the theories that existed in 2004. |
| Korr IM, ed. <i>The Neurobiologic Mechanisms in Manipulative Therapy</i> . New York, NY: Springer; 1978. | first look into the nervous system and how much it controls disease. |
| Lederman E. <i>The Science and Practice of Manual Therapy</i> . Amsterdam: Elsevier Health Sciences; 2005. | It is a well written practical evidence based guide on the rationale behind manual therapy much of which applies to chiropractic. We are still limited in our understanding of how chiropractic works and reading widely can only help us as a profession. |
| Slosberg M. Update on manipulation and exercise. <i>Dyn Chiropr</i> . 2009;27:15. | This overview of exercise and chiropractic treatments can be very helpful for practicing chiropractors who want to involve patients in their care and guide patients from passive care to active care. This model of care is documented in the literature, creates responsible active patients, and is most successful. |
| Eriksen K. <i>Upper Cervical Subluxation Complex: A Review of the Chiropractic and Medical Literature</i> . Philadelphia, PA: Lippincott Williams & Wilkins; 2004. | Provides an evidence base for Upper Cervical Specific Chiropractic as of 2004. |
| Guyatt G, Rennie D, Meade MO, Cook DJ. <i>Users' Guides to the Medical Literature: Essentials of Evidence-Based Clinical Practice</i> . 3rd ed. New York, NY: McGraw-Hill; 2015. | Any practicing clinician should be required to read this book. It provides her/him with the essential tools to appraise and implement scientific evidence into clinical practice. |

^a Study in bold is available on the WFC Suggested Reading List for Chiropractic as of May 18, 2017.

While we spent considerable time and thought developing and testing our Web mechanism for data entry and ease of use, we strive to clarify the extensive work that was necessary to compile the list of faculty. The WFC was efficient in responding to our list of international chiropractic programs, which included contact information and multiple names. The Association for Chiropractic Colleges (ACC) is another resource for information and collaboration. Membership in both organizations (1 by individual and 1 by institution) does come with a fee. Involvement is either on an administrative level or by incurring substantial cost in attending conferences. Further, membership in such chiropractic associations may be closed to faculty members who are nonchiropractors, as were 20% of our survey respondents. We are aware of only 1 other resource for connecting faculty through a listserv of members through the American Chiropractic Association (ACA), although the European Chiropractors' Union (ECU) also appears to have that capacity.¹⁵⁴ To our knowledge, the ACA list is not widely used, and we were unable to ascertain if the ECU maintains a faculty listserv by a review of their website.

In our information age, should we be able to easily form a chiropractic faculty association? Should this be a subset of the WFC? Whether through the rigors of existing organizational structure or through a more informal social media prospect, this seems a viable and beneficial option. While we are no longer interested in pursuing a compilation of essential literature, a grassroots platform (as well as

a vetting mechanism for its use) would surely provide for a low-cost, feasible mechanism for establishing communication, fostering collaborations, and conducting research with chiropractic faculty worldwide.

Limitations

The response rate to this survey was poor. While the acquisition of faculty contact information was favorable for some chiropractic programs, it was very challenging to obtain cooperation and/or responses from many others. While we could contact most of the US chiropractic programs, many international chiropractic programs did not reply to our requests for information. Therefore, we are not able to make a comparison of readings lists provided by faculty from different geographic regions, as any conclusions we might make based on such an underrepresentative analysis would be spurious at best.

CONCLUSION

A systematic approach to surveying educators in all international chiropractic institutions was accomplished. The results of this survey provide a cursory list of essential literature for the chiropractic profession. An interesting follow-up or related study would be an examination of the scientific literature used in chiropractic program syllabi. We recommend establishment of a chiropractic faculty registry for ease of communication and collaboration. This could be done under a current established organization,

such as the WFC, or alternatively as an international entity affiliated with the ACC.

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About the Authors

Barbara Mansholt is an associate professor in the clinic at Palmer College of Chiropractic (1000 Brady Street, Davenport, IA 52803; barbara.mansholt@palmer.edu). Stacie Salisbury is an assistant professor at the Palmer Center for Chiropractic Research, Palmer College of Chiropractic (741 Brady Street, Davenport, IA 52803; stacie.salisbury@palmer.edu). Lance Corber is the data core manager in the office of data management and biostatistics at Palmer Center for Chiropractic Research, Palmer College of Chiropractic (741 Brady Street, Davenport, IA 52803; lance.corber@palmer.edu). John Stites is a professor and director of community clinics with Palmer College of Chiropractic (2001 52nd Avenue, Moline, IL 61265; stites_j@palmer.edu). Address correspondence to Barbara Mansholt, 1000 Brady Street, Davenport, IA 52803; barbara.mansholt@palmer.edu. This article was received March 7, 2017, revised May 24, 2017, and accepted June 18, 2017.

Author Contributions

Concept development: BM, SS, JS. Design: BM, SS, JS, LC. Supervision: BM. Data collection/processing: BM, LC. Analysis/interpretation: LC, SS. Literature search: BM, SS, JS. Writing: BM, SS, LC. Critical review: BM, SS.

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