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Contents

JCCA Vol 54 No 1 ISSN 00083194

Editorial Board

Dr. André Bussières, DC, MSc, PhD candidate

Dr. André Bussières
University of Ottawa

The CCA is delighted to announce that Dr. André Bussières has been named the recipient of the 2009 CCA Young Investigator Award.

This award recognizes young researchers working in the field of chiropractic and is given for a paper submitted for this competition that has not yet been published, or for a recently published paper. The investigator has not had his/her degree longer than two years before submitting the work.

Dr. Bussières was nominated by Dr. Allan Gotlib, JCCA Editor, Dr. Frank Mangoni, Chair of the CCA Research Committee and Dr. Jeff Warren, Governor from Alberta.

Dr. Bussières is well published for a Young Investigator and among his many other publications, in 2008 and 2009 he published two very significant papers in the JCCA entitled:

1 Research consortium workshop III to advance the Canadian Chiropractic Research Agenda. J Can Chiropr Assoc 2009; 53(1):7–13.
2 Chiropractic research capacity in Canada in 2008. J Can Chiropr Assoc 2009; 53(2):78–86.

In addition, he was the principal investigator of three diagnostic imaging practice guidelines for musculoskeletal complaints in adults. These were published in JMPT and recently posted on The National Guideline Clearinghouse™.

Dr. André Bussières is a CMCC graduate (1991) and completed a BSc in Nursing in 1987 and an MSc in Kinesiology in 2008. He is a Fellow of the College of Chiropractic Sciences (Canada) and serves as a member of the JCCA Editorial Board and as a peer reviewer to a number of journals. To date he has written over 20 scientific and clinical articles and 3 book chapters.

Dr. Bussières was in full time practice from 1993 to 2002 and remained in part time practice until recently. He is a full professor at UQTR and was program director of the chiropractic department between 2005 and 2008.

Currently Dr. Bussières is undertaking his PhD training in Population Health at the University of Ottawa and is supported by an admission scholarship. His supervisor is Dr. Jeremy Grimshaw who is the Director of the Canadian Cochrane Network and Center and also a Canada Research Chair in Knowledge Transfer.

His PhD research thesis focuses on Knowledge Trans-

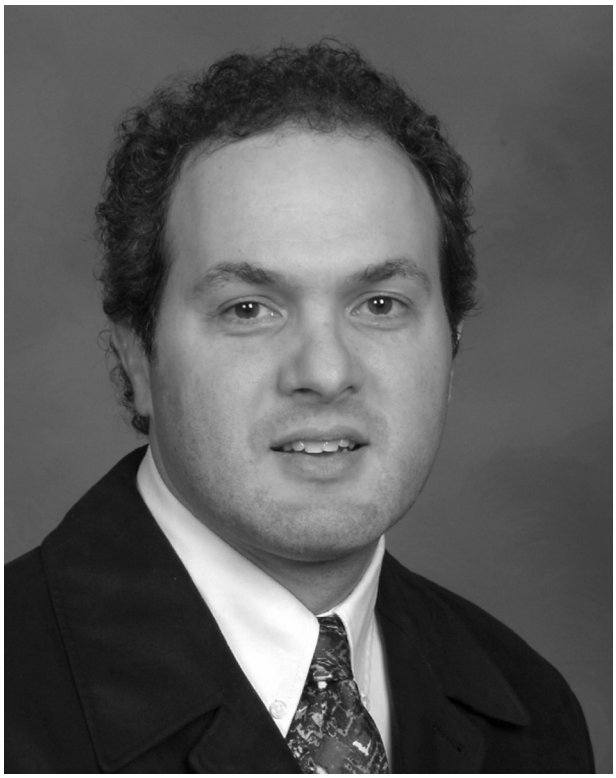
fer and Exchange (KTE) of clinical practice guidelines and the overall goal of his thesis project is to establish a scientific rationale for interventions to translate research findings into clinical practice.

In addition, he recently won two international prizes, from the European Chiropractic Union (ECU) and the Association of Chiropractic Colleges Educational Conference (ACC-RAC), National Board of Chiropractic Examiners, for his paper entitled: "Diagnostic imaging guidelines implementation study: A randomized trial with postal follow-ups."

Dr. Bussières has made very significant contributions to the chiropractic community during the past several years. His extraordinary dedication to advancing the profession and his leadership skills will bring tremendous benefit to the profession in the coming years.

Congratulations to Dr. Bussières!

CCRF President's Citation Award



Dr. Frank Mangoni, DC
Chair
CCA Research Committee

The Canadian Chiropractic Research Foundation is delighted to announce that Dr. Frank Mangoni DC is the recipient of the distinguished CCRF President's Citation Award.

The Award represents a high level of achievement and commitment to serving the profession and is presented to an outstanding chiropractor whose service reflects the highest ideals of the profession.

The Award inscription reads as follows:

Presented to
Dr. Frank Mangoni DC

The officers and members of the Canadian Chiropractic Research Foundation extend to you their sincere and profound appreciation for the longstanding devoted and invaluable service rendered by you to the Foundation and the Chiropractic Profession. This award is presented to you to acknowledge the respect and esteem in which you are held by your colleagues.

Dr. Drew Potter DC
President
2009–2010

Dr. Mangoni received his Bachelor of Science Degree in Biochemistry in 1991 from the University of Toronto. In 1995 he graduated from the Canadian Memorial Chiropractic College and has since been in clinical practice. In the past 15 years of service to the profession, Dr. Mangoni has made very significant contributions to the chiropractic community.

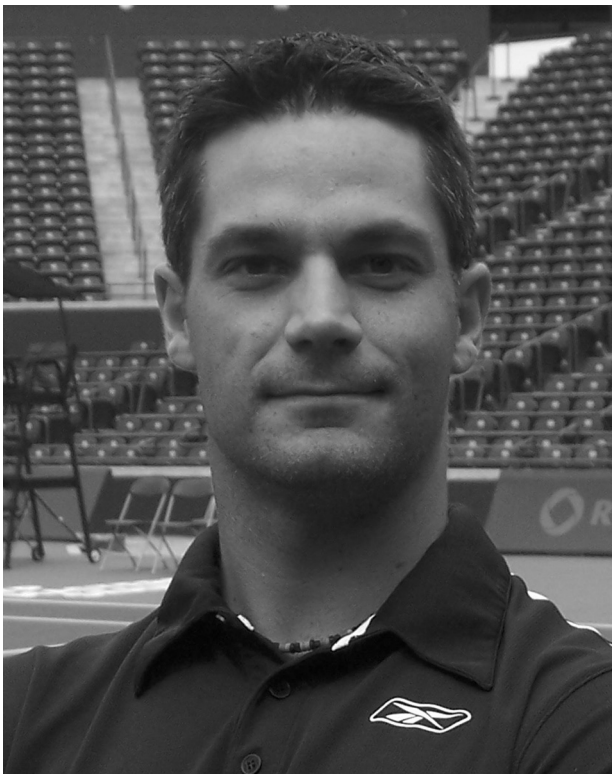
He has served on countless committees during his career, including:

- Vice President, NBCA: 1997–1998
- President, NBCA: 1998–2004
- CCA Governor for NB: 2004–Present
- Chair, NBCA Complaints Committee: 1997–1998
- Chair, NBCA Board: 2004-Present
- Chair, CCA Research Committee: 2006–Present
- Chair, CCA Relocation Committee: 2009

Clearly, Dr. Mangoni has lead an exceptional career and is a true exemplar who brings distinction and honour to the profession.

Congratulations to Dr. Mangoni!

Profile – Dr. Brad Murray, BA, MSc, AT, DC



Dr. Brad Murray, BA, MSc, AT, DC
PhD Program Rehabilitative Sciences
McMaster University

Dr. Brad Murray graduated in 2003 from York University with a BA in Kinesiology (Specialized Honours) and also his 3 year certificate in Athletic Therapy. In 2005 he received his Master of Science Degree in Kinesiology (Neuromuscular Physiology) from the University of Western Ontario after defending his thesis work entitled: "Differential fatigue responses between voluntary and electrically induced contractions of the human dorsi flexors."

He went on to graduate from the Canadian Memorial Chiropractic College, obtaining his Doctor of Chiropractic in 2009. In September 2009, he was accepted into the Doctoral Program in Rehabilitative Sciences at McMaster University in Hamilton, Ontario.

Dr. Murray's research interests focus on shoulder injury and his proposed thesis work will investigate the predictive value of glenohumeral internal rotation deficit (GIRD) in shoulder complex pain and dysfunction.

Shoulder injury is very common in the work place. Glenohumeral internal rotation deficit (GIRD) has been correlated to shoulder pathology in elite overhead athletes in both baseball and tennis, however, similar mechanisms that cause this motor control imbalance are prevalent in many work place tasks and activities of daily living. His research will identify those subjects with microtraumatic overstrain injuries, associated with repetitive tasks, and correlate these findings to shoulder, cervical and thoracic pathology. He hypothesizes that GIRD will increase as severity of microinstability injury increases.

Dr. Murray has received many awards including the following:

- McMaster CN Graduate Scholarship in Rehabilitation Science (2009–2010)
- CIHR QLP Strategic Training Fellow in Rehabilitation Research (2009–2010)
- CIHR/CMCC Health Professional Student Research Award (2007)
- Teaching Assistant of the Year nominee, University of Western Ontario (2003–2004 & 2004–2005)
- Magnum Scholarship, York University (2002–2003)
- Dr. Charles Bull Scholarship, York University (2001–2002)
- Student Athletic Therapist of the Year, York University (2000–2001)
- York University academic achievement list (1998–2003)

In addition, he has published his research in the Journal of Applied Physiology:

McNeil CJ, Murray BJ, Rice CL. Differential changes in muscle oxygenation between voluntary and stimulated isometric fatigue of human dorsiflexors. J Appl Physiol. 2006 Mar;100(3):890–5. Epub 2005 Nov 10.

Dr. Murray has distinguished himself with his volunteer activities which include:

- Chiropractic Intern – St. Johns Rehabilitation Hospital (2008–2009)
- Chiropractic Intern – Canadian Memorial Chiropractic College outpatient clinic (2008)
- Head athletic therapist for the York University male varsity hockey team (2002–2003)
- Head athletic therapist for York University male varsity baseball team (2001–2002)
- Volunteered over 800 hours at 3 different clinics in the capacity as a student Athletic Therapist under certified Athletic Therapists and Physiotherapists (Tait McKenzie Sports Injury Clinic, Athletes Care, and Center for Health and Sports Medicine) between (2000–2003)
- Medical Staff for Vanier Cup (2000–2001).
- Medical Staff Toronto High School Football Finals – Metrobowl (2000–2001)

Dr. Murray will undertake his PhD training program under the supervision of Dr. Jay Triano DC, PhD who holds academic appointments at both McMaster University and the Canadian Memorial Chiropractic College. Dr. Triano's biomechanics laboratory is fully equipped for kinematic analysis with optoelectronic and electromagnetic measures as well as electromyography equipment and is using shoulder testing protocols after FIT-HaNSA methods.

Profile – Dr. Carol Cancelliere, BSc (Hons), DC

Dr. Carol Cancelliere, BSc (Hons), DC
Masters candidate
Master of Public Health program
Lakehead University, ThunderBay, Ontario

Dr. Carol Cancelliere attained her Honours Bachelor of Science degree from the University of Toronto in 2000, majoring in biology and physiology. She graduated from the Canadian Memorial Chiropractic College in 2004 with clinic honours and immediately undertook fulltime practice.

Her motivation to enrol in the Master of Public Health program was to influence health care mainly by working in the areas of 1) health promotion, and 2) integrated health care whereby chiropractic plays a major role and is accessible to all Canadians.

Her thesis topic will focus on health in the workplace since this is where a majority of adults spend their day. It is anticipated that employers will be seeking effective and cost-effective programs given the realities of an aging and declining workforce. There is a lack of expertise regarding health programs at the workplace. A short supply of occupational physicians in Ontario further emphasizes the need to widen expertise in this area.

The overall objective of her research team is to develop an innovative multidisciplinary workplace health promotion and wellness program to improve *presenteeism* at the workplace. Presenteeism is defined as decreased on-the-job productivity. It is often a hidden cost to employers as workers are physically present but unable to perform at peak levels due to a health condition.

Her thesis will focus on Phase 1 of this objective which involves systematically reviewing the literature to: 1) understand the health issues affecting workers who work despite health problems; 2) determine which interventions are effective in reducing the impact of these health issues; and 3) identify characteristics of successfully implemented workplace health promotion and wellness programs. She will be supervised by Dr. David Cassidy DC, PhD, Dr.Med.Sc. Also on her committee are Dr. Pierre Côté, DC, PhD, Dr. Carlo Ammendolia, DC, PhD and Dr. Bill Montelpare, PhD.

Dr. Cancelliere has received several distinguished awards. In 2002, Dr. Cancelliere received the CIHR Health Professional Student Award. In 2003 she received the Association of Chiropractic Colleges Research Scholarship Award and in 2004 she was the recipient of the CMCC Best Research Project Award.

Chiropractors at McMaster University: The formation and direction of a university-based multidisciplinary chiropractic working group

Steven R. Passmore, DC, MS†
John J. Riva, BA, DC§
Charles H. Goldsmith, PhD*

At present globally there are rare examples of chiropractic training in publicly funded universities.[1] The absence of a university-style research tradition, coupled with a lack of access to government funding has acted as a barrier to the scientific development of the chiropractic profession.[2]

Within chiropractic educational facilities there are no formal programs cultivating chiropractic clinician researcher development.[3] In examining the development of clinician researchers, Coulter (1986) observed "to become a productive researcher the student requires prerequisite knowledge of the area, skills in research methodology, academic values and attitudes, a supportive environment, and advisors/mentors with specific responsibility for monitoring the students' progress."[4] It has also been recognized that research infrastructure, located outside of traditional chiropractic colleges is needed for the profession to develop productive clinical research programs.[3]

Professions of any health care discipline having faculty members at publicly funded universities are afforded academic freedom while maintaining the growth and development of their profession, with a focus on active scholarly publication thus fostering a strong research culture.[5] A university setting reduces barriers to interdisciplinary research and allows clinical collaboration that utilizes the most current technology. A university, or university hospital setting also allow for clinician training, incorporation of experimental treatment protocols and facilitate delivery of health care to the general public.[1] The chiropractic profession needs to remodel its present approach to clinical education and research to remain relevant in an era of evidence-based practice.[6]

Since January of 2009, a group of chiropractors that also have an affiliation with McMaster University, have been meeting quarterly on the McMaster campus. These affiliations may be as graduate students (chiropractors who are currently in pursuit of a Masters or PhD, or are medical residents), full-time, part-time, or adjunct faculty, clinical faculty, research affiliates, academic committee members or those who supervise McMaster medical interns in their clinical environment. The group allows chiropractors that are operating at some capacity within the mainstream university system to become aware of their colleagues. It also assists to foster collaboration among these colleagues within such an environment to serve and enhance the chiropractic profession in improving patient care.

With the support of the Canadian Chiropractic Association and the Ontario Chiropractic Association, the group has been able to expand and thrive. Meetings consist of a member of the group presenting on a topic that relates to their McMaster University affiliation, followed by a round table discussion. At a recent meeting, a McMaster University Professor Emeritus, (Department of Clinical Epidemiology & Biostatistics) Dr. Charlie Goldsmith was present. He led the group through a workshop to identify

For the McMaster Chiropractic Working Group
† Graduate Student, Department of Kinesiology, McMaster University, Hamilton, ON & Fellow, Department of Research, New York Chiropractic College, Seneca Falls, NY.
§ Department of Family Medicine, McMaster University, Hamilton, ON.
* Professor Emeritus, Department of Clinical Epidemiology & Biostatistics, McMaster University, Hamilton, ON.
Funding: Dr. Passmore is funded by an Ontario Graduate Scholarship & New York Chiropractic College Fellowship. The McMaster Chiropractic Working Group is supported in part by the Canadian Chiropractic Association & the Ontario Chiropractic Association.
Competing Interests: None.
Correspondence to: Dr. Steven Passmore, Department of Kinesiology, IWC AB131B, McMaster University, 1280 Main Street West, Hamilton, ON L8S 4K1. Tel: (905)525-9140 x26086. Fax: (905)523-6011. email: passmosr@mcmaster.ca

what specific priorities and collaborative goals the group should strive toward, to become productive.

The workshop focused on how the chiropractic working group could become a useful part of McMaster University. A workshop exercise was derived from a textbook called "The Quality Toolbox,"[7] and was broken up into three distinct phases:

1 brainstorming
2 affinity diagrams
3 interrelationship digraphs

The process allowed for anonymous intellectual brainstorming, which prevents power imbalances in groups with diverse backgrounds, and individuals at various stages in their respective careers or positions by giving each person an equal voice. Having each group member write three ways to answer the question "How do we make ourselves a useful part of McMaster University?" on three separate pieces of paper was the first step. The pieces of paper were then passed to a neighbour, and again one more idea was added per person based on this new information.

An affinity diagram was created with the results of the brainstorming session, in which like ideas were grouped together.[8] This was achieved by posting all the ideas on a wall so that first, everyone could read them, and then second, people could freely move ideas around in attempt to group them. This was done in silence, and all pieces of paper were moved with the non-dominant hand of the person moving it. Once the ideas were grouped, a key-word summary of the concept from each grouping was created. The McMaster chiropractic working group came up with 7 concepts (see Table 1).

To interpret the meaningfulness of the concept summaries from Table 1, pair wise comparisons were performed to determine the relationship of concepts to each other. This is deemed an "interrelationship digraph."[8] Some concepts require input from other concepts to become reality. On the other hand, some concepts generate output used to fuel additional concepts. In the end it was revealed that, to prioritize goals for the working group, the concepts that need to be prioritized, are those that generate the most output to the other concepts. The high output generating activities will allow for the greater facilitation of the concepts that require the most input over the course of time.

The McMaster chiropractic working group came to the conclusion based on this exercise that it is through scholarly writing, that the greatest output can be achieved. This could take the form of grants, editorials, seed funds, and peer reviewed publications. The productivity of the group would be monitored by an internal group curriculum vitae and be an agenda item at each meeting. As such, the group has prioritized the various aspects of writing to proceed as a functional working group on collaborative projects. Balancing strategic interests, structured supports, technical knowledge and skill, and a culture of collaboration are crucial to the group's success over the long term.[9] Lastly, faculty members of the group must be able and willing to share, not own, curricular turf.[10]

This workshop and group development process offers to act a template for other university-based working groups. There are vast resources and opportunities within the publicly funded education system as evidenced by the chiropractic professions in other countries.[11] This manuscript also offers to inform other chiropractors presently operating in isolation (as clinicians, scientists, clinician scientists or clinician scientists in training) within other publicly funded universities of the practical application

Table 1 *Interrelationship Digraph Results**

Concept	Number Requiring Input	Number Generating Output
Attract External Funding	3	1
Increase Awareness	2	3
University Integration	6	0
Public Education	2	4
Contribute to Daily Operations of University Capacity and Function	2	2
Attract Prospective DC Graduate Students	3	2
Writing: Generate and Disseminate Original Grants/Research/Peer Reviewed Publications	0	6

* Input and Output do not all sum to 6 as some relationships were considered to be equally an input and output, when considered pairwise.

of group formation and interdepartmental collaboration.

Acknowledgements

McMaster Chiropractic Working Group members present for this workshop: Dr. Dan Avrahami, Dr. Craig Bauman, Dr. Steve Burnie, Dr. Charlie Goldsmith, Dr. Ryan Larson, Dr. Keshena Malik, Dr. Steven Passmore, Dr. John Riva.

Guests: Dr. Dave Brunarski (Ontario Chiropractic Association), Dr. John Tucker (Canadian Chiropractic Association).

We gratefully acknowledge the insight of Dr. Jason Busse, CIHR/CCRF Chiropractic Research Chair at McMaster University, during the development of this paper. Also, we extend our thanks to those working group members absent from the workshop but whose discourse at prior, and subsequent meetings aided in the formation of this manuscript.

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2010 Olympic Winter Games Chiropractic: The Making of History

Gregory P. Uchacz, DC, FCCSS(C), CSCS, FICC*

Gregory P. Uchacz, DC, FCCSS(C), CSCS, FICC

Since its establishment well over a century ago, chiropractic has played a valuable role with athletes from recreational sports to international competition. And, for over half a century the chiropractic sports community has been firmly entrenched with sport organizations as a valued partner in health care delivery. In one of the first documented partnerships, Dr. Harry Williams, a Canadian chiropractor, worked in the 1950's with the Toronto Maple Leafs professional hockey team, providing years of professional service. Dr. Williams gained a renowned reputation for enhancing athlete performance and reducing time loss from injury.

As the Canadian population began to develop a greater interest in structured physical activity and participate in the trend of organized sport, the demand for sports-centred chiropractic grew. By 1970, there were nearly 1000 chiropractors registered in the province of Ontario alone; a number substantially larger than when it first received legislation in the 1920s. As professional membership grew, special interest groups began to emerge. One of the earliest and most prominent factions was in the area of sports chiropractic.

Modern day sports chiropractic in Canada evolved from two previous organizations. The first, termed the Canadian Academy of Chiropractic Sports Therapists (CACST) was soon renamed after a debate surfaced regarding the profession's concern with the word "therapist." As a result, CACST was soon renamed the Canadian Chiropractic Sports Academy (CCSA) in 1978.

The CCSA gradually became less active over the next several years and after a period of dormancy, sports chiropractic was re-organized in Canada with yet another name change to reflect its rebirth and modernization. The organization, College of Chiropractic Sports Sciences (Canada), or CCSS(C), evolved out of the ever growing need to coordinate and direct the involvement of the chiropractic profession with athletic and sport-minded communities. Receiving its charter from the Canadian Chiropractic Association in October 1984, the CCSS(C) was granted its patent letters by the Ministry of Consumer and Corporate

* President – College of Chiropractic Sports Sciences (Canada).
2002, 2006 & 2010 Olympic Team Health Care Member, Canadian Sports Centre – Provider. 120, 602–12th Avenue SW, Calgary, Alberta T2R 1J3.

Affairs, for the Government of Canada. Moving forward, the CCSS(C) continued to expand and mature into an influential part of Canada's sports health care community.

A decade ago, two significant advancements in organization took place. First, the CCSS(C) established the Sports Sciences Residency Program (SSRP); a redesigned program centred on a specific program mandate and detailed objectives to offer chiropractic sports specialty training through post-secondary educational institutions throughout Canada. With a minimum of 1000 hours of field work, graduate level academic focus on exercise physiology, sports nutrition, sports psychology, advanced imaging, research methodology, acute injury management and other aspects of sports chiropractic, the SSRP was designed to provide extensive sports specialty training. This graduate level training began to produce a new breed of Chiropractic Sports Fellow, emerging better prepared than ever before to represent sports chiropractic throughout Canada and the world.

The second major advancement for the CCSS(C) was the inclusion of Sports Fellow selections as part of Canadian health care teams. These teams exist to provide support for athletes at international events for which Canada participates. Since our inaugural selection, chiropractors have been represented on Canadian Core Health Care Teams that accompany support staff and athletes to Minor/Developmental and Major Games. Minor or Developmental Games include the World University Games (Summer and Winter), World Francophone Games, Commonwealth Games and Canada Summer and Winter Games. Major Games are the Pan American Games, and the Olympic and Paralympic Summer and Winter Games. Currently, the Canadian Health Care Team for these various Games reserve positions for chiropractors, specifically those with the CCSS(C) Sports Fellowship designation (FCCSS(C)). As a result, sports chiropractors have become firmly entrenched in the multidisciplinary care of athletes. Furthermore, Sports Fellows have gained access to established funding support for the treatment of national level athletes with several Canadian Sport Centres throughout the country. As sports specialists with a unique view of the body and its mechanics, sports chiropractors were being requested to participate in health care teams for a variety of national and international athletic events; a path to the full inclusion of sports chiropractic in the mainstream sport medicine model.

As we forward to present day, the CCSS(C) and sports chiropractic in Canada has reached another truly outstanding milestone. For the first time ever, chiropractic was included as part of the host medical services for the 2010 Winter Olympic Games. Within the infrastructure of the Vancouver Organizing Committee (VANOC) and with backing from the IOC Medical Commission, chiropractic was an equal partner in the health care delivery to all participants of the 2010 Games. Chiropractic has now joined with equal footing, all other therapy services (physical therapy, athletic therapy, massage therapy, sport acupuncture) in the delivery of health care. This is an unparalleled accomplishment in the chiropractic profession and was made possible through the history of integration of sports chiropractic into all aspects of the Canadian sports health care system.

The 2010 Olympic Winter Games proved to be the best yet at providing a truly inclusive and innovative approach to health care delivery. With polyclinics located within the athlete village sites for both the Olympic and Paralympic Games in Whistler and Vancouver, and health care support at competition venue sites, coordination at the Games was truly monumental. It was the vision of Dr. Jack Taunton, VANOC Chief Medical Officer, that chiropractic plays an integral goal in the integrative team approach. Dr. Taunton noted, "It was as a result of sports chiropractic leadership, integration into mainstream health care, and vision that I presented to the IOC Medical Commission the inclusion of chiropractors within our therapy team for the 2010 Olympic Winter Games." Through chiropractic acceptance Dr. Taunton was able to establish a truly inter-professional collaborative model of health care delivery with chiropractors and other health care professionals working side by side to the best benefit of those they serve.

With chiropractic inclusion ensured, Dr. Jack Taunton and Rick Celebrini (Manager – Medical Services & Therapy) required the enlisting of a chiropractic manager to coordinate all aspects of chiropractic services. Dr. Robert Armitage, a Vancouver-based chiropractic Sports Fellow was the obvious choice given his extensive credentials, prior involvement with Dr. Taunton as chiropractor for the Vancouver Grizzlies Professional Basketball Team, and professional relationship with many in the Vancouver sports health care community. Through his expertise and passion for sports chiropractic, Dr. Armitage was

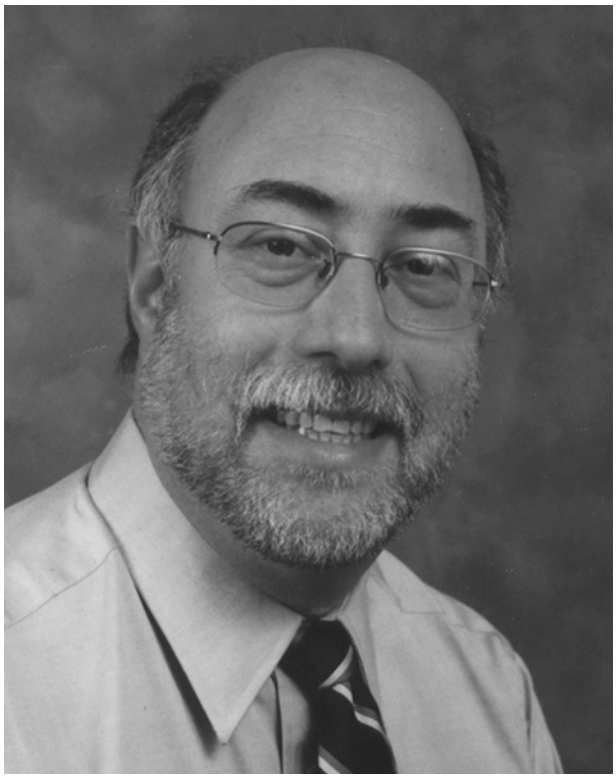
extremely well suited to lead the profession through our inaugural inclusion with the Olympic family. The number of Olympic athletes and team officials totaled 5,500 from 80 different countries and Paralympic athletes and team officials reached 1,350 from 40 different countries. This was a staggering amount of international participants and chiropractic was able to gain exposure like never before in the world of elite sport.

Now that the 2010 Olympic Winter Games with an athlete centred, comprehensive health care delivery system has obtained this stage of reality, the mission, vision, and philosophy for health care coverage has achieved its goals.

It is through the dedication of so many chiropractors who have given of their time and expertise over the past two and half decades that the CCSS(C) has eliminated the professional barriers that have limited full chiropractic integration into all aspects of the sports health care system. It is through this greater inter-professional communication that the creation of mutual professional respect has emerged. Through our inclusion, we now have an opportunity to support the Olympic mission, vision, and philosophy. It is now our opportunity to be part of history – the opportunity of a lifetime to participate in the Olympic and Paralympic Winter Games. Chiropractic showcased its unique and specialized skill set, gained recognition and gave back to the sport community through professional association, and helped promote volunteerism in Canada and throughout the world. The social and professional interactions with people from all over the world has been unparalleled in our history. The entire profession watched enthusiastically as the CCSS(C) and sports chiropractic played a pivotal role in establishing full integration of chiropractic into the Olympic medical services model.

A Teaching Scholar Program in Chiropractic Education

Dana J. Lawrence, DC, MMedEd*



Dana J. Lawrence, DC, MMedEd*

Introduction

Over the course of the past 20 years, there has been growing acknowledgement that there is a significant need to provide faculty development which enhances the teaching skills and scholarship of the healthcare education community. This is certainly equally true within the chiropractic profession specifically but far less research exists which is addressed to the needs of the chiropractic academic community. As noted by Rosenbaum et al[1], a number of challenges exist in providing opportunities for faculty to obtain training in teaching skills. These include the need for there to be someone with faculty development expertise to lead such a program, lack of locally-based advanced educational training programs, interest solely coming from highly motivated educators and lack of departmental members who can assist or take on such training opportunities. They conclude that institutions need to seek ways to expand resources available for training. They recommend increasing the number of faculty with advanced expertise in education, and to use peers to offer training once they have gained that expertise (as noted below). At several chiropractic colleges, there are also challenges arising from the nature of their collective bargaining agreements, each of which has specifications for faculty performance that may at times be at odds with the need to implement faculty development programs.

Few programs have been reported in the healthcare literature with the specific purpose of helping faculty develop expertise in providing teaching skills to their peers. Most follow train-the-trainer models.[2] As part of Palmer College's R25 grant award, we are using a train-the-trainer model for implementing enhanced use of evidence-based methods in the classroom setting. We are first training a small number of interested faculty in the use of EBP; those individuals will then be placed in position to provide training to their peers.

But it is important to note that most faculty development programs still focus on developing participant skills for their own teaching. The goal of the teaching scholar program (TSP) described here is to combine teaching ef-

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fectiveness training with leadership skills to develop a cohort of teachers with increased personal skills who can transmit them to their peers. This program is designed to provide skills directed at the higher level components of health care education as opposed to general education theory and methodologies, and thus will serve as a means of providing advanced teacher training. Further, it is designed to be a selective program.

This paper first reviews other teaching scholar programs before describing a proposed program for faculty educational training.

A Review of Teaching Scholar Programs

A special issue of *Academic Medicine* was devoted to reporting on teaching scholar programs across the United States. As already noted, Rosenbaum and colleagues[3] were instrumental in developing and implementing a TSP in the Carver College of Medicine at University of Iowa. Goals for that program included (1) promoting development of a cadre of faculty with the skills to implement faculty development in their departments, (2) increase departmental involvement in faculty development, (3) increase resources for dissemination of college-wide faculty development efforts, and (4) acknowledge the effort that faculty put into developing their skills and in helping train their colleagues. Interested faculty must apply for the program and must meet specific acceptance criteria. Incentives include a $2000 stipend to attend a medical education conference, support from program staff, receipt of a certificate at program end, and formal recognition as a teaching scholar in college publications. The program curriculum consists of (1) monthly half-day training sessions that focus on specific skills in either instructional design, teaching skills or professional development; (2) teaching self-improvement activities involving reflection; (3) videotaped performance evaluations in classroom; and (4) completion of a faculty development project.

Muller and Irby[4] developed a TSP for the University of California School of Medicine in San Francisco. Their overall goal was to produce educational leaders for UCSF, and therefore they offered accepted faculty learning experiences in 7 areas: learning theory, teaching methods, curriculum development and evaluation, assessment of learning, leadership and organizational change, career development, and educational research. This program requires a weekly 3-hour seminar, with reading assignments and writing exercises. Most sessions have a short initial presentation, followed by a writing experience on the topic. This is then followed by a seminar discussion, typically student-led. Faculty participants are also required to complete a scholarly project. The model offered for learning objectives for this program is one adaptable for use within a chiropractic college setting. Table 1 offers broad program objectives.

The program at McGill University was developed by Steinert and McLeod.[5] This program is a year in length and focuses on 5 major educational themes: curriculum design and innovation, effective teaching methods and evaluation strategies, educational program evaluation, research in medical and health sciences education, and educational leadership. Its primary goal is to help faculty learn more about educational principles and methods, pursue scholarship in medical education, and prepare for educational leadership roles. Scholars admitted into the program are expected to devote 1 day per week to the activities required to complete the year-long program. The program includes 2 university-based courses from the faculty of education, a monthly seminar, an educational project and participation in faculty-wide development activities. In addition, the organizers have instituted a monthly educational journal club. Assessment has indicated this program is meeting its goals quite well.

The program at the University of Washington[6] was initiated by the same David Irby mentioned above with regarding UCSF. The mission for this program is defined as "to promote academic excellence through the development of a vibrant community of leaders in education who can innovate, enliven and enrich the environment at the University of Washington." Scholars attend sessions one-half day per week for 10 months, with many of the sessions led by the scholars themselves. They work in collaboration with program leaders to decide upon course readings, but are responsible for teaching material to each other. Scholars are exposed to topics on educational research, leadership, team building, verbal communication, learning theory, curriculum development, creating and evaluating tests, etc. Each scholar is required to complete a capstone project prior to completing the program.

The mission of the Medical Education Scholars Program at the University of Michigan is to develop educational leadership, improve teaching skills, and promote educational scholarship among the medical school fac-

Table 1 *Chiropractic College Teaching Scholars Program General Learning Objectives*

Learning Objectives: At the end of the year-long program, scholars will be able to
1. Analyze how *learning theory* relates to the design of curriculum and educational activities. • Understand and assess different learning theories. • Apply theories of learning to instructional practices. • Assess the research evidence related to different learning theories. • Analyze the successful use of technology to enhance learning.
2. Demonstrate the ability to use various *teaching methods* appropriately. • Analyze the relationship between learning styles and teaching styles. • Determine elements of instructional design. • Master various teaching strategies. • Large group • Small group • Simulations • One-on-one • Develop expertise in giving feedback.
3. Determine the steps in *curriculum development and evaluation.* • Identify different curricular models. • Describe the process of curriculum development. • Design a program evaluation. • Determine how to identify the costs of a curriculum. • Analyze approaches for obtaining informed consent for curricular research. • Examine the relationship between accreditation and curriculum.
4. Master various *assessments of learning.* • Interpret reliability and validity of measures of tests and assessment instruments. • Analyze the strengths and weaknesses of various assessment strategies. • Design assessments of • Knowledge. • Attitudes. • Skillful performance. • Design a survey. • Select appropriate course and instructor evaluations.
5. Analyze *leadership in organizations* and develop *leadership skills.* • Discuss leadership styles, behaviors and functions. • Identify leadership opportunities in medical education locally and nationally. • Assess educational leadership opportunities within and outside the university. • Discuss organizational change.
6. Reflect on and plan their *academic careers.* • Establish career goals and benchmarks. • Describe the academic promotion process. • Revise CV and develop an Educator's Portfolio. • Develop mentoring skills.
7. Develop skills in *educational research* sufficient to propose, conduct, analyze, and present astudy. • Write a proposal with a well-defined research question. • Select appropriate research designs and measures for given research questions. • Devise an analytical plan that addresses power, analytical challenges, missing data, and procedures. • Identify characteristics of accepted and rejected studies. • Write an abstract for medical education research. • Critique an educational research article.

ulty.[7] Their program follows the academic calendar and meets weekly from September through June for 3 hours per meeting. The curriculum is divided into 5 broad domains: teaching and learning topics; cognition topics; educational assessment topics; academic leadership sessions; research methods and methodology. Scholars in the program are also mentored by senior faculty, and are required to complete a scholar's project. Faculty scholars lead workshops and then undergo what has been termed an 'autopsy" examining their performance as workshop leader. A journal club is incorporated into this program as well.

The program at the University of Arkansas[8] evolved over a period of years but has at its center a series of monthly 3-hour workshops related to teaching and educational research, combined with lectures from nationally well-known health science educators. Scholars are required to complete a project, similar to the other programs noted above.

Table 2 summarizes the key aspects of each program described above.

Discussion

There are several commonalities among all the programs described above. First, all have at their base the need to train faculty in educational methodologies and procedures, all require an application process, all require a research or educational project, and most require at least a modicum of scholar involvement in the development and teaching of seminars and workshops.

Educational topics that are common to most of the program include teaching skills, curriculum development and evaluation, educational research, academic leadership, and learning theory. These topics seem logical and should form the basis for a Teaching Scholar Program for use in a chiropractic college. A discussion of curriculum can be found below.

Challenges

One of the challenges that several chiropractic colleges face is their collective bargaining agreement (CBA). Decisions regarding who may be chosen for the program, release time necessary to participate in the program, and any funding decisions that much be made must be placed into the legal context required by the CBA. Further, the mode of course delivery is a challenge; would it be better to plan live in-class sessions, to work thought an educational framework such as BlackBoard or WebCT given the time commitments that academic faculty and clinicians face, or find some other delivery system? Should the program be "excusive" in that it will admit a limited number of people each year, perhaps no more than a single person per department?

Proposed Curriculum

The following topics would form the basis for such a program:

- Learning theory in health-care education
  1. Principles of teaching and learning
     a. Scholars will formulate guiding principles on which students can be encouraged to build their learning skills
  2. Teaching methods
     a. Scholars will be able to design instruction from which students will be able to learn concepts, principles and problem-solving
     b. Scholars will be able to design instruction from which students will be able to learn skills or procedures
     c. Scholars will be able to design instruction from which students will be able to learn attitudes
     d. Scholars will be able to evaluate the potential of a range of teaching methods to facilitate learning of specific types of outcomes
- Curriculum development in health-care education
  1. Trends in curriculum development
     a. Scholars will be able to demonstrate an understanding of the 6 trends in curriculum development
     b. Scholars will be able to reflect on the extent to which these trends are applicable to a course that the scholar teachers
  2. Principles of curriculum development
     a. Scholars will demonstrate an understanding of 8 concepts underlying curriculum development
     b. Scholars will demonstrate an understanding of 8 ideas derived from the 8 concepts
     c. Scholars will reflect on the extent to which the 8 ideas are applicable to a course which they teach
     d. Scholars will analyze a course for which they are responsible in terms of the Hardin's SPICES model of educational strategies

Table 2 *Key program components*

Program	Application Process	Curriculum	Project Required
University of Iowa	(1) Ability and/or potential for leadership in educational faculty development efforts; (2) Motivation and interested in issues related to teaching; (3) Ability to communicate effectively with faculty in the department; (4) Ability to work effectively with others and to responsive to feedback; (5) Willingness to make the necessary time commitments	Half-day training sessions focused on instructional design, teaching skills and professional development; teaching self-improvement; reflection	Yes, focusing on enhancement of teaching and related skills relevant to departmental needs
UCSF	(1) Application form; (2) CV; (3) Goal statement; (4) Letter of support from department chair	7 areas: learning theory, teaching methods, curriculum development and evaluation, assessment of learning, leadership and organizational change, career development, and educational research.	Yes, to reflect Boyer's expanded definition of scholarship: discovery, integrationapplication, teaching
McGill University	(1) Letter outlining anticipateg goals for the program; (2) description of educational project; (3) explanation of how their involvement will benefit their department; (4) two letters of recommendation, including one from the chair.	5 major themes: curriculum design and innovation, effective teaching methods and evaluation strategies, educational program evaluation, research in medical/health sciences education, and educational leadership. Two formal courses, monthly seminar, educational project.	Yes, an educational project or evaluation of a curricular initiative.
University of Washington	(1) CV; (2) Written response to questions about current and past scholarship, educational philosophy and personal and professional goals; (3) proposal for educational project; (4) letter of support from the chair.	Core topics include introduction to learning theory, history of health professions education, educational research basics, curriculum development, creating and evaluating tests, instructional methods, professionalism.	Capstone project may include designing, implementing and evaluating an educational innovation or a workshop or curriculum.
University of Michigan	(1) CV; (2) written description of their educational responsibilities in medical school, goals and expectations and their for the program; (3) description of an educational project.	Meets weekly, and has 5 core areas: teaching and learning topics, cognition topics, educational assessment topics, academic leadership topics and research methods topics.	Projects can focus on curriculum development and evaluation, use of educational technology, etc.
University of Arkansas	Not defined	Monthly 3-hour workshops related to teaching and educational research.	Not defined.

3. Needs analysis for curriculum development
   a. Scholars should be able to review quantitative and qualitative strategies for needs analysis for curriculum development
   b. Scholars should be able to design appropriate strategies for diagnosis of curriculum development needs

- Teaching methodology in health-care education
  1. Principles of assessment
     a. Scholars will understand the difference between summative and formative assessment
     b. Scholars will understand the difference between criterion and norm-referenced assessments
     c. Scholars will be able to construct clear instructional objectives
     d. Scholars will be able to differentiate between facts, procedures, concepts and principles in the context of assessing student learning
     e. Scholars will be able to describe the characteristics of content, predictive, concurrent and construct validity
  2. Problem-based learning
     a. Scholars should be able to select an appropriate approach for use in their own situation
     b. Scholars should develop PBL sessions appropriate for use in their own situation
     c. Scholars should embark on facilitating a PBL group
     d. Scholars should be able to define PBL
     e. Scholars should be able to identify criteria for PBL and identify the advantages and disadvantages associated with PBL
     f. Scholars should reflect on their performance and that of their students
  3. Self-assessment in the teaching process
     a. Scholars will be able to reflect on his or her teaching and understand the key components of the self-assessment process
     b. Scholars will construct a self-assessment tool which has practical benefits
     c. Scholars will be able to describe the advantages of self-assessment for both the student and the teacher
     d. Scholars will understand the value of feedback and its role in quality self-assessment
- Educational Research in health-care education
  1. Research awareness
     a. Scholars will be able to describe the scientific method
     b. Scholars will be able to identify the key questions to ask in problem selection
     c. Scholars will be able to describe the advantages of a research plan
     d. Scholars will be able to write directional and null hypotheses that relate to a research problem
     e. Scholars will be able to state and explain the reasons for conducting a literature search before commending a research project
     f. Scholars will be able to describe the differences between primary and secondary sources and give examples of each
  2. Approaches to research
     a. Scholars will be able to explain differences between qualitative and quantitative research
     b. Scholars will be able to describe circumstances in which experimental, historical, descriptive, correlational, causal-comparative and action research designs are used
     c. Scholars will be able to clearly distinguish between the procedures/ designs used in each method
     d. Scholars will be able to identify the advantages and disadvantages of each approach
  3. Designing and administering questionnaires
     a. Scholars will be able to carry out the key stages in questionnaire design
     b. Scholars will be able to construct questionnaire items
     c. Scholars will be able to write both open and closed questions
     d. Scholars will be able to distinguish between postal and interview type questions
     e. Scholars will be able to design an effective questionnaire on a given topic
     f. Scholars will be able to identify when the questionnaire method is appropriate
- Academic leadership in health-care education
  1. Leadership
     a. Scholars will be able to describe leadership roles in various areas

b. Scholars will describe negotiation skills and conflict resolution strategies
c. Scholars will be describe the roles of consultation, seminars, peer support, and mentoring in the development of leadership skills
d. Scholars will be able to discuss organizational dynamics and gender

Assessment

The literature is replete with assessment strategies for teaching scholar programs, but chief among them is review and evaluation of curriculum vitae over time. Analysis may include number of publications, participation in college committee or leadership positions, decisions to gain additional education through a master's or doctoral level program, presentations at conferences, etc. In addition, focus groups and surveys may be used to track participant attitudes and opinions regarding the effectiveness of the program. One can track scholar perceptions of the program's strengths and limitations (a process evaluation) as well as whether or not scholars accomplished what they set out to do (an outcome evaluation). Faculty interest can be another measure of success. Essentially, it is possible to see if participation in the program leads to increased teaching effectiveness, as measured through course valuations, and increased scholarly productivity, as measured by CV analysis.

Implementation

I offer this program for discussion among our educators and administrators. There are few formal teaching effectiveness programs within chiropractic education, and certainly the typical faculty in-service can only offer small amounts of training at a given time. Without ongoing programs in place, our faculty are hampered by their time commitments and work loads from engaging in further study. This program can be incentivized as well, but should be seen as something to strive for.

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Chiropractic care for patients with asthma: A systematic review of the literature

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Objective: *To provide a review of the literature and rate the quality of published studies regarding chiropractic care, including spinal manipulation, for asthmatic patients.*

Methods: *A multimodal search strategy was conducted, including multiple database searches, along with reference and journal hand-searching. Studies were limited to those published in English and in peer-reviewed journals or conference proceedings between January 1980 and March 2009. All study designs were considered except personal narratives or reviews. Retrieved articles that met the inclusion criteria were rated for quality by using the Downs and Black checklist. A brief summary was also written for each retrieved study.*

Results: *Eight articles met the inclusion criteria of this review in the form of one case series, one case study, one survey, two randomized controlled trials (RCTs), one randomized patient and observer blinded cross-over trial, one single blind cross study design, and one self-reported impairment questionnaire. Their quality scores ranged from 5 to 22 out of 27.*

Conclusion: *Results of the eight retrieved studies indicated that chiropractic care showed improvements in subjective measures and, to a lesser degree objective measures, none of which were statistically significant. It is evident that some asthmatic patients may benefit from this treatment approach; however, at this time, the evidence suggests chiropractic care should be used as an adjunct, not a replacement, to traditional medical therapy.*
(JCCA 2010; 54(1):24–32)

Objectif : *présenter une analyse de la documentation et évaluer la qualité des études publiées relativement aux soins chiropratiques, notamment la manipulation rachidienne, prodigués aux patients asthmatiques.*

Méthodes : *une stratégie de recherche multimodale comprenant plusieurs recherches de banques de données fut développée, en plus des recherches dans les revues. Les études étaient limitées à celles publiées en anglais dans les revues évaluées par les pairs ou lors de congrès entre janvier 1980 et mars 2009. Tous les plans d'étude ont été considérés, à l'exception des analyses ou textes personnels. Les articles récupérés qui répondaient aux critères d'inclusion ont été évalués en fonction de leur qualité selon la liste de vérification Downs and Black. Un bref résumé a également été rédigé pour chaque étude trouvée.*

Résultats : *huit articles ont répondu aux critères d'inclusion de cette analyse sous la forme d'une série de cas, une étude de cas, un sondage, deux essais cliniques aléatoires, un essai croisé aléatoire à l'insu avec patient et observateur, un plan d'étude croisé unique à l'insu, et un questionnaire de type auto-déclaration sur les déficiences. Les pointages sur la qualité variaient entre 5 et 22 sur 27.*

Conclusion : *les résultats des études récupérées indiquaient une amélioration des soins chiropratiques dans des mesures subjectives, et à moindre degré, des mesures objectives, aucune d'entre elle n'étant statistiquement significative. Il est évident que certains patients asthmatiques peuvent bénéficier de cette méthode de traitement ; cependant, en ce moment,*

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des preuves démontrent qu'on doit recourir aux soins chiropratiques à titre complémentaire, et non pour remplacer la thérapie médicale.
(JCCA 2010; 54(1):24–32)

KEY WORDS: asthma, chiropractic, spinal, manipulation

MOTS CLÉS : asthme, chiropratique, rachidienne, manipulation

Introduction

Chiropractic is among the three most commonly utilized complementary and alternative medicine (CAM) therapies.[1] As a result, practitioners in this realm of health care are certain to encounter a vast array of clinical conditions ranging from common to obscure. According to the World Health Organization, asthma is now a serious public health problem with over 100 million sufferers worldwide.[2] It can be expected that chiropractors, along with other CAM practitioners, will be treating asthmatic patients. Sources of management and treatment guidelines mention pharmaceutical interventions and trigger avoidance as key items; however, many of these sources fail to mention CAM therapies.

Many chiropractors have experienced success in the treatment of non-musculoskeletal conditions, dating back to the very first adjustment. In this day and age, the scope of chiropractic care ranges from traditional spinal manipulation, to nutritional advice, to exercise prescription. The clinical question, however, is whether CAM interventions can benefit the asthmatic, and whether chiropractors should be the primary health care providers or provide co-management. Moreover, it must be determined if the chiropractic care provided to asthmatic conditions is directed at improving asthma-related symptoms (i.e. breathing) or if it is targeted towards the spinal symptoms (i.e. pain, stiffness, lose of motion) secondary to the asthma.

Towards that end, a number of studies have been aimed towards analyzing the effects of spinal manipulative therapy (SMT) in relation to forced expiratory volume (FEV), quality of life, self reported asthma severity, medication dependency and other measures, without consideration of the complete chiropractic encounter. The purpose of this systematic review of the literature was to rate the quality of the existing evidence for the chiropractic care of patients with asthma.

Methods

This study was approved by the Ethics Review Board of the Canadian Memorial Chiropractic College.

MEDLINE, CINAHL, AMED, Alt Healthwatch, Index to Chiropractic Literature, MANTIS and the Cochrane Database of Systematic Reviews were searched for relevant literature between January 1980 and March 2009. The MeSH terms used were: Asthma, Chiropractic, Manipulation, Chiropractic, Manipulation, Spinal, Musculoskeletal Manipulations. Text words for the same concepts were also searched. The search terms were combined to limit the amount of articles obtained as each individual term used yielded greater than 1000 results and the findings were not specific to the chiropractic profession. Hand-searching of conference abstracts and proceedings that were deemed acceptable for inclusion were obtained where appropriate. The reference lists of all retrieved articles and conference proceedings from the database searches were hand-searched for further relevant articles not included in the electronic literature search. The table of contents of relevant journals including the Journal of the Canadian Chiropractic Association and the Journal of Manipulative and Physiological Therapeutics were hand-searched for additional relevant articles.

The authors scrutinized the electronic search results, the titles and abstracts in particular, and the full articles of the citations were obtained if they included outcomes of chiropractic care for patients with asthma. All study designs were considered except personal narratives or review articles.

The inclusion and exclusion criteria used for this review are described in Table 1. These criteria were applied to all of the obtained full articles and conference proceedings. The reference lists of all retrieved articles, conference abstracts, and proceedings from the database searches were hand-searched for further relevant articles not included in the electronic literature search.

Table 1 *Review of selection criteria*

Inclusion Criteria	Exclusion Criteria
Study must have at least one patient	Patients have not been diagnosed with asthma
Treatments administered by a qualified chiropractor	Treatments not administered by qualified chiropractor, i.e. performed by medical doctor, physical therapist, osteopath, etc
Papers written in English	Papers not written in English
Published between January 1980 and March 2009	Published before 1980
Prospective or retrospective studies including RCTs, controlled clinical/quasi-experimental trials, cohort, case control, case series, and survey designs	Personal narratives, or reviews
Study must use some outcome measure for determining the effect of chiropractic care on asthma or breathing	Studies deficient of an outcome measure
Published in peer-reviewed journal or conference proceedings/abstracts	Published in non-peer reviewed journal

The three principal authors reviewed the studies meeting the inclusion criteria and conducted a critical appraisal of the full-text articles. The data from all included articles and conference abstracts/proceedings were recorded onto a data extraction sheet by the authors as part of the review. The authors checked and edited all entries for accuracy and consistency. Recorded data included study authors and quality score, details of the study design, sample, interventions, outcome measures, and main results/conclusions of the study.

The methodological quality of the studies that met the selection criteria was assessed by the authors using the 27-item scoring checklist developed by Downs and Black.[3] The scoring checklist is considered valid and reliable for assessing randomized and nonrandomized studies.[3] It was determined, partially through retrieving articles, that there likely would not be many randomized controlled trials, and as such, a methodological scoring system allowing nonrandomized studies to be evaluated was considered necessary. Items 5 and 27 were revised from the original Downs and Black checklist to be worth 1 point each so that the modified total score was 27. The authors individually reviewed each included article for quality (based on the Downs and Black checklist) using a quality scoring sheet. Quality scores above 20 were considered good; 11–20, moderate; and below 11, poor.[7] The three authors independently rated all the studies, recorded final scores for each article, and resolved any differences by discussion.

Results

The initial electronic searches identified 152 citations (including overlapping citations between databases), three from AMED, two from Alt HealthWatch, 12 from MEDLINE, 34 from CINAHL, 45 from the Index to Chiropractic Literature, 56 from MANTIS and one from the Cochrane Database of Systematic Reviews. This systematic review evaluated the evidence for the effects of manual therapies for treatment of patients with bronchial asthma. While chiropractic manipulation was mentioned as a method of manual therapy in the Cochrane review, it was not included as it did not meet the inclusion criteria. However, the Cochrane review was utilized by hand searching the reference list for additional articles but none were found. One additional article was identified by hand searching the reference list from the review article written

by Hawk et al.[4] Hand searching the table of contents of several chiropractic journals did not yield any additional articles. The full texts of 13 articles[4–17] were obtained after screening the titles and/or abstracts to determine if they would meet the inclusion criteria. Eleven articles came from electronic database searches, one came from hand searching conference proceedings, and one came from reference list evaluations.

Eight articles met all of the inclusion/exclusion criteria for this review. Seven[5,8,9–11,14,17] were identified by the electronic database searches and one was identified by hand searching conference proceedings.[16] The remaining five articles[6,7,12,13,15] were excluded for a variety of reasons. All 13 articles were written in English.

The eight selected articles included: one case series, one case study, one survey, two randomized controlled trials (RCTs), one randomized patient and observer blinded cross-over trial, one single blind cross study design, and one self-reported impairment questionnaire. Table 2 provides information on each of the eight included studies with respect to study design, sample, interventions, outcome measures, results, and conclusion. As well, the quality scores for each article have been included.

Description of Studies

(1) McKelvey SE, Hayek R, Ali S. Asthma and chiropractic. A multi-centre approach. Proceedings 5th Biennial Congress, Auckland, NZ. World Federation of Chiropractic, May 17–22 1999: 166–7.

Score on Down's and Black Checklist: 7

McKelvey et al,[17] conducted a 6-week single blind cross study, reported as an abstract only, on 32 patients diagnosed with asthma and under medical management. Peak flow, spirometry, and salivary samples were recorded from each subject. Subjects were treated with an adjustive manoeuvre that was accompanied by an audible joint cavitation or an examination with little or no intervention. There was no statistically significant difference in group spirometry readings before and after treatment. Clinically important subjective improvements include reduced number of asthma attacks and reduced medication use reported by all subjects in the trial.

(2) Balon J, Aker PD, Crowther ER, Danielson C, Cox GP, O'Shaugnessy D, Walker C, Goldsmith CH, et al. A comparison of active and simulated chiropractic manipulation as adjunctive treatment for childhood asthma. N Engl J Med. 1998 Oct 8; 339 (15):1013–1020.

Score on Down's and Black Checklist: 22

Balon et al[5] conducted a randomized controlled trial on 91 children aged 7–16 who had continuing symptoms of asthma despite medical treatment. Subjects were randomly assigned to receive either active or simulated chiropractic manipulation for four months. Peak expiratory flow was measured from a change in base line. Of the 91 children, 80 had outcome data that could be evaluated. Small increases in both treatment groups were noted, with no statistically significant difference between groups with reference to a change in baseline measurements. Asthma symptoms and use of β-agonists decreased and quality of life increased in both groups with no statistically significant difference between groups. The authors concluded that children with mild to moderate asthma would not benefit from the inclusion of chiropractic spinal manipulation to usual medical care.

(3) Graham RL, Pistolese RA. An impairment rating analysis of asthmatic children under chiropractic care. J Vertebral Subluxation Research. 1997; 1 (4): 1–8.

Score on Down's and Black Checklist: 7

Graham and Pistolese[10] conducted a self-reported impairment study on 81 children aged 1–17 before and after a two month period of chiropractic care. Significant reduction (improvement on the modified Oswestry rating scale) was reported for 90.1% of subjects after 60 days of chiropractic treatment. Girls reported less improvement after care compared to boys, however significant decreases in impairment ratings were reported for both sexes.

(4) Bronfort G, Evans RL, Kubic P, Filkin P. Chronic pediatric asthma and chiropractic spinal manipulation: A prospective clinical series and randomized clinical pilot study. J Manipulative Physiol Ther. 2001; 21 (6): 369–377.

Score on Down's and Black Checklist: 20

Bronfort et al[8] conducted a prospective clinical case ser-

Table 2 *Features of included studies*

Study authors; Quality score	*Study design*	*Sample*	*Interventions*	*Outcome measure*	*Main results/conclusions*
Mckelvey et al;[16] 7/27	6-week single blind cross pilot, abstract only	32 patients	Chiropractic care, 18 manipulations	Spirometry reading, peak flow and vital capacity, and number of asthma attacks	No statistical difference in-group spirometry reading before and after treatment. Peak flow and vital capacity were reduced ($p<.05$)
Balon et al;[5] 22/27	Randomized controlled trial	91 children aged 7–16	Chiropractic manipulation	Peak expiratory flow, asthma symptoms, quality of life, and satisfaction with treatment	No statistical difference between groups, symptoms decreased in both groups with no statistically significant differences between groups
Graham and Pistolese;[10] 7/27	Self-reported impairment questionnaire	81 children aged 1–17	Chiropractic care-detection and elimination of subluxation	Modified Oswestry Impairment Rating Scale (MOIRS)	Significantly lower impairment rating for 90.1% of subjects. Greater clinical effect for boys
Bronfort et al;[8] 20/27	Prospective clinical case series and observer blinded pilot RCT	36 patients aged 6–17	Chiropractic spinal manipulation	Pulmonary function tests, rated quality of life, peak expiratory flow rates	Children rate quality of life higher, effect maintained at one year. No important changes in lung function
Nielson et al;[17] 20/27	Randomized patient and observer blinded cross-over trial	31 patients aged 18–44	Chiropractic spinal manipulation	Forced expiratory volume, forced vital capacity, use of brochodilators, patient rated severity	No clinically important or statistically significant differences found between active and sham interventions
Leboeuf-Yde et al;[14] 15/27	Survey	385 chiropractors on 5607 patients	Spinal manipulation with or without additional therapy	Self-reported impairment on questionnaire	Most common was improved breathing, minority of patients reported improvement of non-musculoskeletal symptoms
Gibbs;[9] 9/27	Case series	3 patients	Chiropractic spinal manipulation	Peak flow and asthma questionnaire	Increased subjective and objective parameters, need for larger studies
Green;[11] 5/27	Case study	1 patient, 43y	Chiropractic spinal manipulation	Peak flow, use of medications	Positive objectives changes in peak flow and decrease in medication use

ies and observer blinded randomized controlled trial on 36 patients aged 6–17 with mild and moderate persistent asthma. Patients were randomly assigned to receive either active spinal manipulation or sham spinal manipulation. At the conclusion of the 12-week intervention, lung function tests and patient-rated day and night-time symptoms showed little or no change. A 20% reduction in β-bronchodilator use was seen, quality of life scores increased by 10% to 28%, and asthma severity rating showed a 39% reduction. The changes in patient-rated severity remained unchanged at 12-month post treatment follow-up.

(5) Nielsen NH, Bronfort G, Bendix T, Madsen F, Weeke B. Chronic asthma and chiropractic spinal manipulation a randomized clinical trial. Clinical and Experimental Allergy. 1995; 25: 80–88.

Score on Down's and Black Checklist: 20

Nielson et al[17] conducted a randomized patient and observer blinded cross-over trial on 31 patients aged 18–44 suffering from chronic asthma. Patients were randomized to receive either active chiropractic spinal manipulative treatment or sham spinal manipulative treatment two times per week for four weeks. No clinically important or statistically significant differences were found between active and sham manipulations on forced expiratory volume, use of inhaled bronchodilators, patient-rated asthma severity, and non-specific bronchial reactivity. Non specific bronchial hyperreactivity improved by 36% and patient-rated asthma severity decreased by 34%.

(6) Leboeuf-Yde C, Pedersen EN, Bryner P, Cosman D, Hayek R, Meeker WC, et al. Self-reported nonmusculoskeletal responses to chiropractic intervention: A multination survey. J Manipulative Physiol Ther. 2005; 28: 294–302.

Score on Down's and Black Checklist: 15

Leboeuf-Yde et al[14] conducted a multination survey from 385 chiropractors on 5607 patients receiving spinal manipulation with or without additional therapy. Positive reactions in non-musculoskeletal symptoms were reported by 2–10% of patients. Of these patients, 27% noted positive reactions in non-musculoskeletal symptoms and also noted improved breathing. Variables identified that may influence the outcome included: patients informed that the reactions may occur (odds ratio [OR] 1.5); treatment directed to the upper cervical spine (OR 1.4); treatment directed to the lower thoracic spine (OR 1.3) and; female sex (OR 1.3).

(7) Gibbs AL. Chiropractic co-management of medically treated asthma. Clin Chiropractic. 2005; 8: 140–144.

Score on Down's and Black Checklist: 9

Gibbs[9] conducted a case series on three patients with asthma treated with chiropractic manipulation to the upper thoracic spine two times per week for six weeks. All three cases resulted in increased objective changes in peak flow using a spirometer. As well, increased subjective data was noted in all patients from a recorded asthma diary.

(8) Green A. Chronic asthma and chiropractic spinal manipulation: a case study. Br J Chiropractic. 2000; 4 (2): 32–35.

Score on Down's and Black Checklist: 5

Green[11] conducted a case study on one patient aged 43 years old with asthma diagnosed at 38 years of age. The subject was treated with spinal manipulation to the lower cervical spine, upper thoracic spine, and costovertebral joints. Trigger-point therapy and post-isometric relaxation techniques were used to the hypertonic musculature. Initial spirometry measurements demonstrated a peak expiratory flow of 430 L/min. Over a 12-month treatment period, there was an increase in the peak flow from 430 to 550 L/min. As well, the subject noted a decrease in medication use.

None of the studies indicated any adverse effects or evidence of harm (other than exacerbations of asthma) to patients treated by chiropractors. Studies by Balon[5] and Nielsen[17] were the only ones to mention adverse effects/reactions as part of the article and to formally state that there were no adverse events. All other articles included in this study did not mention adverse effects. None of the included articles included a comprehensive list of possible adverse effects from the intervention.

Quality of Articles

Table 3 depicts the quality scoring of each of the included articles. The overall level of disagreement of the evaluators, after independent rating, was 3.2% (7/216). These differences were rectified through discussion. The methodological quality of the articles was poor to good. The highest score on the Downs and Black[3] scoring system was 22/27, achieved by the Balon et al[5] study. The studies by Bronfort et al,[8] Nielsen et al,[17] and Leboeuf-Yde et al[14] achieved moderate quality ratings of 20, 20, and 15 respectively. The other four studies[9–11,16] all rated poorly (<11) in methodological quality.

The included studies yielded good to low quality ratings on the Down and Black[3] scoring checklist. The poor and moderate ratings were primarily due to problems with external validity (questions 11 and 12, Table 3), which addresses the representativeness of the findings of the study and determines whether they can be generalized to the population from which the study subjects were derived. Poor and moderate ratings were also due to a lack of randomization to groups, blinding of subjects or those measuring the outcomes.

Discussion

In treating asthmatic patients, the objective of chiropractic spinal manipulative therapy (high amplitude, low velocity thrusts) is to increase the motion of the thoracic cage, mobilize the ribs, enhance arterial supply and lymphatic return, and to affect nervous system activity, all in hope of reducing symptomatology of the patient.

To the knowledge of the authors, this is the first systematic review of the literature specifically examining chiropractic care for the treatment of asthma. For the purposes of this review, chiropractic care encompassed spinal manipulative therapy, mobilizations, soft tissue therapy and/or breathing exercises. Although the studies evaluated for this review showed some patient improvement with chiropractic care, the quality of this evidence was, at times, questionable and for this reason it is insufficient in determining direct therapeutic benefit. Assessing the effectiveness of chiropractic treatment of patients with asthma is multifactorial and an array of outcome measures exist, both subjective and objective.

Subjective measures varied amongst the selected literature, including reported number of asthma attacks, medication use, quality of life, patient-reported changes in asthma symptomatology, modified Oswestry rating scale, and asthma diary logs. A noticeable trend of improvement in these measures was recognized across the reviewed literature, although none were statistically significant.

Spirometry readings were the main objective measures used in the selected literature. These included peak expiratory flow, vital capacity and forced expiratory volume. Some improvements in these objective measures were noted, however, as with the subjective measures, none were statistically significant.

The main limitation amongst the selected literature was the lack of detail regarding the location and type of manipulative technique used. This lack of information hinders the reproducibility of the study design. With this being stated, chiropractors are trained to locate and manipulate restricted vertebral segments in the attempt to induce motion. Whether or not certain types of chiropractic manipulations are more beneficial than others is a pertinent question that should be explored in further investigations.

It is encouraging to note that, in the two articles that commented on it, no patients were reported to experience any worsening of symptoms or injuries while under care. Although it is tempting to attribute this to the care provided, it is equally possible that, since these children were being medicated during the time they received chiropractic care, any worsening of their condition would have been masked by their drugs. Additionally, although it is encouraging that many of the children in the studies referred to in these articles were able to experience a decrease in their medication use, it is possible that these same children were being over-medicated initially.

No statistical significances were obtained with chiropractic care during the treatment of children with asthma. However, positive clinical changes were seen in a number of subjects leading to the conclusion that spinal manipulative therapy may be sought as an adjunct to medical management. In stating this, it is important to note that there is a chance that this treatment modality may be of little to no benefit for certain patients and therefore the authors recommend a trial of care to identify whether or not chiropractic care should be included in the overall management of their condition.

Conclusion

Despite a paucity of evidence supporting the successful management of patients with asthma under chiropractic

Table 3 *Article quality scoring using a scoring method adapted from Downs and Black*[3]

No.	*Brief Item Description*	*Mckelvey et al*[16]	*Balon et al*[5]	*Graham and Pistolese*[10]	*Bronfort et al*[8]	*Nielsen et al*[17]	*Leboeuf-Yde et al*[14]	*Gibbs*[9]	*Green*[11]
1	Hypothesis/aim/objective described?	1	1	1	1	1	1	1	0
2	Main outcomes to be measured described?	1	1	1	1	1	1	1	0
3	Characteristics of patients described?	0	1	0	1	1	1	1	0
4	Interventions of interest clearly described?	0	1	0	1	1	1	1	1
5	Distributions of confounders described?	0	0	0	0	0	1	0	0
6	Main findings clearly described?	0	1	1	1	1	1	0	1
7	Estimates of random variability in data?	0	1	0	1	1	1	0	0
8	Important adverse events reported?	0	0	0	0	0	0	0	0
9	Described patients lost to follow-up?	0	1	0	1	1	0	0	0
10	Actual probability values reported except where P value <.001?	0	1	0	0	1	1	0	0
11	Subjects asked to participate representative of population?	0	0	0	0	0	0	0	0
12	Subjects prepared to participate representative of population?	0	0	0	0	0	0	0	0
13	Staff, places, and facilities representative of treatment majority of patients receive?	1	1	1	1	1	1	1	1
14	Attempt made to blind subjects?	1	1	0	1	1	0	0	0
15	Attempt made to blind those measuring the outcomes to intervention?	0	1	0	0	1	0	0	0
16	Any of the results based on "data dredging," was this made clear?	1	1	1	1	1	1	1	1
17	Analyses adjust for different lengths of follow-up of patients, or is time period between the intervention and outcome the same for cases and controls?	0	1	0	1	1	0	1	0
18	Statistical tests appropriate?	1	1	1	1	1	1	0	0
19	Compliance with treatments reliable?	0	1	0	1	1	0	1	1
20	Outcome measures valid/reliable?	0	1	0	1	1	1	1	0
21	Patients in intervention groups or cases and controls recruited from same population?	0	1	0	1	1	0	0	0
22	Subjects in different intervention groups or cases and controls recruited over same period?	0	1	0	1	0	0	0	0
23	Subjects randomized to groups?	0	1	0	1	1	0	0	0
24	Randomized assignments concealed until recruitment was complete?	0	1	0	1	0	0	0	0
25	Adjustment for confounding in analyses?	0	0	0	1	0	1	0	0
26	Losses to follow-up accounted for?	0	1	0	0	1	1	0	0
27	Sufficient power to detect clinically important effect where P value for difference due to chance is < 5%	1	1	1	1	1	1	0	0
	Total Score (/27)	7	22	7	20	20	15	9	5

care, and despite the fact that the evidence that does exist is heterogeneous with respect to its quality strength, there is nonetheless some indication that patients experience positive subjective and at times positive objective results while under chiropractic care. The approaches described in many of the manuscripts reviewed reflect common clinical practice activities used by chiropractors, including an array of different outcome measures. That said, more evidence is required before any definitive statements can be made with respect to the clinical effectiveness of chiropractic care for patients with asthma and with respect to the most appropriate role chiropractors should play in the management of these patients. Such studies may benefit from the use of a valid and reliable outcome measure such as the Pediatric Asthma Health Outcome Measure (PAHOM).[18]

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Critical sites of entrapment of the posterior division of the obturator nerve: anatomical considerations

Myroslava Kumka, MD, PhD*

In the current anatomic study, special attention was given to the relationship of the posterior division of the obturator nerve to surrounding structures: the obturator canal and the fibromuscular and vascular structures of the medial thigh region. These intimate relationships may, in certain conditions, constitute critical sites of entrapment of the posterior division of the obturator nerve and may present a diagnostic challenge to the manual practitioner. Knowledge of the potential sites of entrapment of the posterior division of the obturator nerve can aid in differential diagnosis of peripheral neuropathies, provide an anatomic basis for obturator nerve pathology, and guide effective patient management, including the application of modern diagnostic techniques and safe surgical procedures.
(JCCA 2010; 54(1):33–42)

KEY WORDS: obturator nerve, medial thigh region, peripheral nerve compression.

Dans le cadre de l'étude anatomique en cours, une attention particulière a été portée à la relation entre la division postérieure du nerf obturateur et les structures avoisinantes : le canal obturateur et les structures fibromusculaires et vasculaires de la région interne de la cuisse. Ces relations intimes peuvent, dans certains cas, constituer des sites critiques d'encapsulation de la division postérieure du nerf obturateur, et présenter un défi considérable au praticien manuel qui tente d'établir un diagnostic. La connaissance des sites potentiels d'encapsulation de la division postérieure du nerf obturateur peut aider à émettre un diagnostic différentiel des neuropathies périphériques, procurer une base anatomique pour la pathologie du nerf obturateur, et guider la gestion efficace du patient, notamment l'application des techniques de diagnostic modernes et les procédures chirurgicales sécuritaires.
(JCCA 2010; 54(1):33–42)

MOTS CLÉS : nerf obturateur, région interne de la cuisse, compression du nerf périphérique.

Introduction

It has been stated that chronic pain in the distribution of the obturator nerve is a difficult diagnostic challenge.[1–4] This pain may be explained by the many potential causes and numerous anatomical structures in the groin area that may be susceptible to injury or disease. These pathologies include adductor muscle strain, tendonitis, bursitis, stress fractures, osteitis pubis, hernia, conjoint tendon strains, inguinal ligament enthesopathy, compression due to prolonged lithotomy position, and entrapment of the peripheral nerves.[5–12]

Compression of the obturator nerve has been described as one cause of groin and adductor region pain, especially in athletes.[1,2,6,7,13]

In all obturator nerve pathology, a sound knowledge of anatomy is the foundation of understanding clinical symp-

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toms and forming an accurate diagnosis. Such knowledge aids not only in greater understanding of clinical symptoms but also in application of modern diagnostic and management techniques such as ultrasound guided nerve block, ultrasound guided biopsy, and magnetic resonance imaging (MRI).[14–22] For example, based on MRI findings, obturator neuropathy, caused by acetabular labral cyst [21] and tumor situated in the obturator foramen,[22] was diagnosed even though the nerve was not visualized. The location of the labral cyst was consistent with the region of the obturator nerve on the lateral wall of the lesser pelvis. Lower limb peripheral nerve blocks are an increasingly common method for providing anesthesia and analgesia of the lower limbs. That is why, in recent years, more and more studies have examined sonographic imaging of the obturator nerve and its divisions by scanning along the expected course of the nerve.[14–16,18–20] However, high anatomic variability in the obturator nerve's divisions[15] in conjunction with the complicated anatomy of the surrounding area makes ultrasound guided obturator nerve block one of the most technically challenging regional anesthesia techniques.[14]

There is considerable information concerning the intrapelvic course of the obturator nerve,[5,7,8,23] but details concerning the obturator and adductor regions of the thigh are sparse. Reports from numerous obturator nerve decompressions have remarked upon variability in the anatomy of the nerve, vasculature, and the myofascial tissue, particularly with reference to the anterior division of the obturator nerve.[6,16,17,18] However, variability in the posterior division of the nerve has not been well documented.[6,15,24,25]

Therefore, the purpose of this paper is to describe the morphological variations of the posterior division of the obturator nerve in relation to the obturator canal, and vascular and myofascial structures of the medial thigh region. The findings of this report provide an anatomic basis for obturator nerve pathology, and may assist diagnosis and effective patient management.

Materials and methods

Fifty six lower limbs from twenty eight (20 males and 8 females) cadavers with an age range of 50–82 years (mean = 66 years) were dissected. The cadavers were preserved with a mixture of formaldehyde and ethanol by embalming within 3–7 days of death, and were stored in vacuum bags at 4ºC for 1–2 years. An identical dissection sequence was used in all specimens studied.

All skin and superficial fascia were removed over the anteromedial thigh to expose the fascia lata. The sartorius muscle was detached from its proximal attachment, and the femoral triangle was dissected free to reveal the femoral vessels and their branches, the pectineus, and the adductor longus muscles. The adductor longus muscle was divided transversely 1–2 cm below its origin. Its distal part was turned toward the femur. The anterior division of the obturator nerve, nerves to adductor longus and gracilis muscles, were located.

The pectineus muscle was divided transversely 1 cm below its origin and turned toward the femur. Branches of the obturator nerve and vessels were identified within the fascial layer. The obturator externus muscle was defined. The adductor brevis muscle was divided close to its origin, and turned laterally, protecting the anterior branch of the obturator nerve. Then, the posterior division of the obturator nerve was identified and traced.

The fascia from the obturator externus and adductor magnus muscles was removed without damaging the branches of the obturator nerve. The obturator externus muscle was carefully removed from its origin and the contents of the obturator canal were dissected out. Then, the obturator nerve divisions and their branches were freed and their distributions were traced. Branches of the obturator vessels and of the deep femoral artery of thigh were dissected out. The relationships between the branches of the nerve and vascular branches were documented. Schematic diagrams were drawn and photographs were taken.

Results

Anatomy of the obturator region

In our anatomical descriptions we used the internationally accepted terminology for human gross or topographical anatomy.* According to this terminology, right and left hip bones (pelvic bones, coxal bones) are the bones of the pelvic girdle.

In mature individuals, the pelvic girdle is formed by three bones: right and left hip bones and sacrum. Each hip bone develops from the fusion of three bones, the ilium,

* Terminologia anatomica: international anatomical terminology. Federative Committee of Anatomical Terminology. Stuttgart, New York: Thieme, 1998:292.

ischium, and pubis. In infants and children, the hip bone consists of three separate bones that are united by cartilage at the acetabulum.

The obturator foramen is a large opening in the hip bone. It is bounded by the margin formed by the following structures: i) superiorly – the obturator surface of the pubic body and the obturator groove, the deeply grooved base of the superior pubic ramus; ii) inferiorly – the ischial and pubic inferior rami; iii) anteriorly – the superior and inferior pubic rami; iv) posteriorly – the inferior ischial ramus. A thin fibrous sheet, the obturator membrane, is attached to the margin of the obturator foramen. The obturator internus and obturator externus muscles are connected with the obturator membrane.

The obturator internus muscle arises from: i) the pelvic surface of the margin of the obturator foramen, ii) the internal surface of the hip bone below and posterior to the pelvic brim, iii) the internal surface of the obturator membrane, the tendinous arch that completes the obturator canal, and iv) the obturator fascia. The fibers converge towards the lesser sciatic foramen and, after receiving the attachments of the gemelli, are inserted into the medial surface of the greater trochanter.

The obturator externus muscle is the deepest muscle of the superomedial part of the thigh. It arises from: i) the margins of the obturator foramen, ii) pubic and ischial rami, and iii) the external surface of the obturator membrane, the tendinous aponeurotic arch which completes the obturator canal. The muscle passes inferior to the acetabulum to attach to the trochanteric fossa.

The superior free edges of the obturator internus muscle and its fascia, the obturator membrane (between the anterior and posterior obturator tubercles), and the obturator externus muscle and its fascia collectively form the musculotendinous aponeurotic arch which converts the obturator groove into an obturator canal. The direction of the canal is i) from superior to inferior, ii) from lateral to medial, and iii) from posterior to anterior. The superior wall of the obturator canal is formed by the floor of the obturator groove. The inferior wall is formed by the rigid edge of the musculotendinous aponeurotic arch.

The contents of the obturator canal include: i) superomedially, nerve to obturator externus muscle, and obturator artery, ii) inferomedially, obturator vein, and iii) superolaterally, anterior and posterior divisions of the obturator nerve, which lay within the obturator groove. The obturator canal is also invested with a variable amount of adipose tissue.

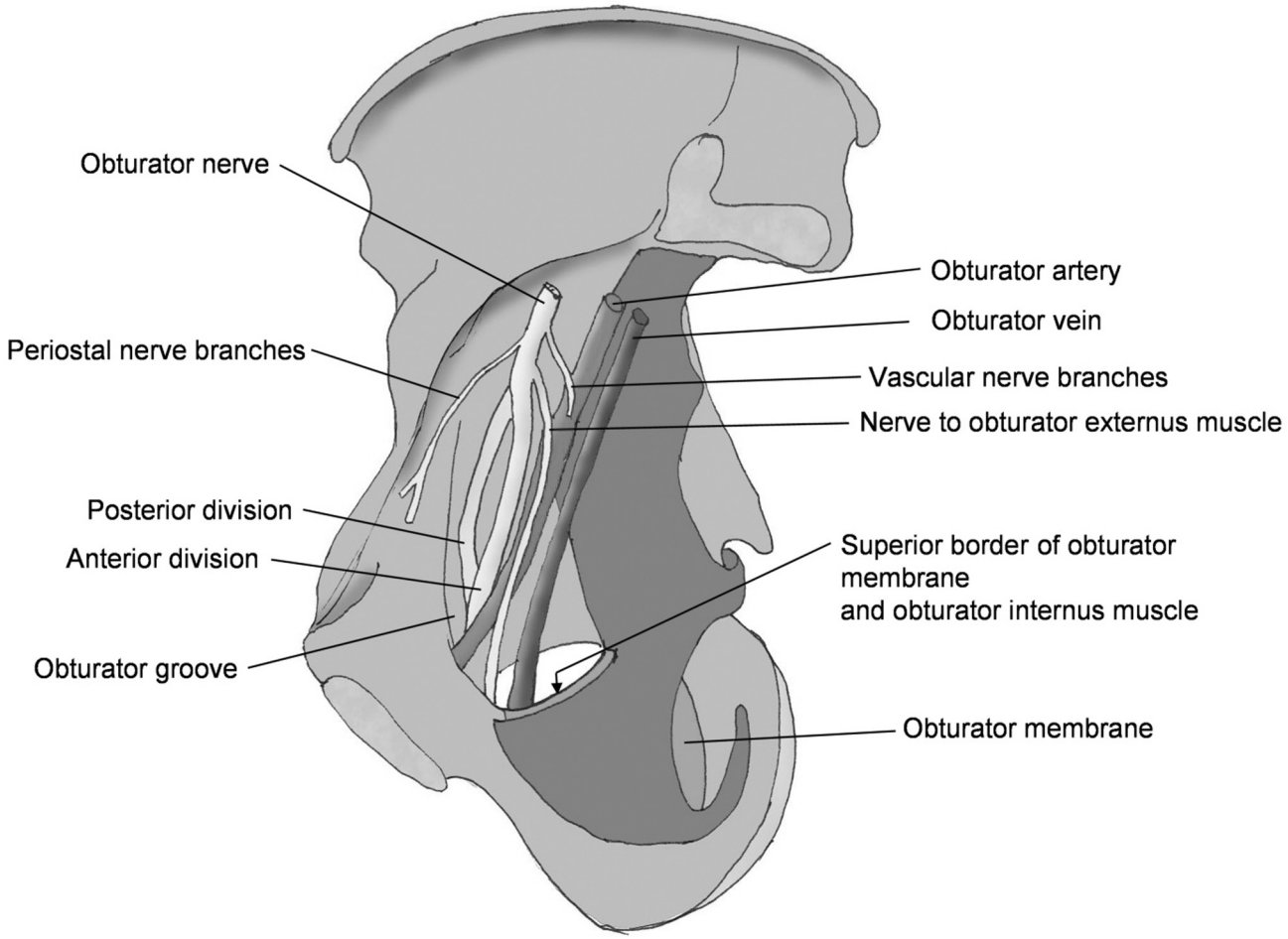
The nerve to obturator externus muscle, arising from the intrapelvic obturator nerve before it splits into divisions, crosses the obturator artery and descends between the obturator vessels. Within the obturator canal, the posterior division of the obturator nerve is bound superiorly by the anterior division of the nerve, and inferiorly by the obturator artery and the nerve to obturator externus muscle. The level of bifurcation of the obturator nerve into the anterior and posterior divisions varies, and bifurcation may occur in the pelvic cavity, or at the entrance, within or at the exit of the obturator canal, and is the object of a separate investigation.

Medial thigh region: myofascial pattern

The adductor muscles of the medial compartment of the thigh are arranged in three layers: i) the superficial layer consisting of pectineus and adductor longus muscles, ii) the middle layer represented by the adductor brevis muscle, and iii) the deep layer formed by the obturator externus and adductor magnus muscles. Each muscular layer is separated by a very definite fascial plane, consisting of fibroelastic connective tissue with variable amounts of adipose tissue condensation around the nerves and vessels. The muscular branches of the obturator nerve and the medial circumflex femoral and obturator vessels ramify within and perforate these intermuscular fascial layers in order to supply the surrounding muscles.

The obturator nerve is formed within the psoas major muscle by the anterior divisions of the anterior primary rami of L2–L4 spinal nerves. The obturator nerve emerges from the medial border of psoas major and passes into the lesser pelvis, being situated inferior to the pelvic brim. In the current anatomic study, it was found that in most cases, prior to entering the obturator canal, the obturator nerve gave off branches to the obturator artery, periosteal nerve branches and the nerve to obturator externus muscle, and then divided into the anterior and posterior divisions. Within the obturator canal, the divisions of the obturator nerve follow the direction of the canal, passing against the canal's superolateral aspect (Figure 1). Exiting the canal, the two divisions of the obturator nerve ran against the musculotendinous aponeurotic arch; in particular, the posterior division of the nerve was in immediate contact with the arch.

Figure 1 *Obturator canal content.*



In 32 lower limbs, the posterior and anterior divisions of the obturator nerve emerged into the thigh anterior to the obturator externus muscle and its fascia, accompanied by the branches of the obturator artery and vein (Figure 2). The anterior division, from its emergence to its final branching in the thigh, and connections with the saphenous and anterior femoral cutaneous nerves, is the object of a separate investigation (manuscript in preparation).

In 22 lower limbs, the posterior division of the obturator nerve, after exiting the canal, descended posterior to the proximal quarter of the obturator externus muscle and its fascia. Then, the posterior division emerged from the substance of obturator externus, perforating it and descending anterior to its distal part (Figure 3).

The nerve branches of the posterior division of the obturator nerve were accompanied by the branches of the obturator vessels. Only in two lower limbs did the posterior division emerge from the inferior border of the obturator externus muscle, descending entirely posterior to it. Once the posterior division of the obturator nerve entered the thigh, it descended deep to the pectineus and the adductor brevis, within the fascial layer overlying the obturator externus and the proximal part of the adductor magnus muscles. From the midpoint of adductor magnus, the posterior division descended within the substance of the anterior part of this muscle towards the adductor hiatus and terminated within the posterior aspect of the fibrous capsule of the knee joint. On its way, the poster-

Figure 2 *The posterior and anterior divisions of the obturator nerve emerged into the thigh anterior to the obturator externus and adductor magnus muscles:*
1 – obturator externus muscle
2 – adductor magnus muscle
3 – posterior division of obturator nerve
4 – anterior division of obturator nerve

Figure 3 *The posterior division of the obturator nerve after exiting the obturator canal, descended posterior to the proximal part of the obturator externus muscle. Then, the posterior division emerged from the substance of obturator externus, perforating it and descending anterior to its distal part:*
1 – obturator canal
2 – obturator externus muscle
3 – adductor magnus muscle
4 – deep fascia
5 – posterior division of obturator nerve

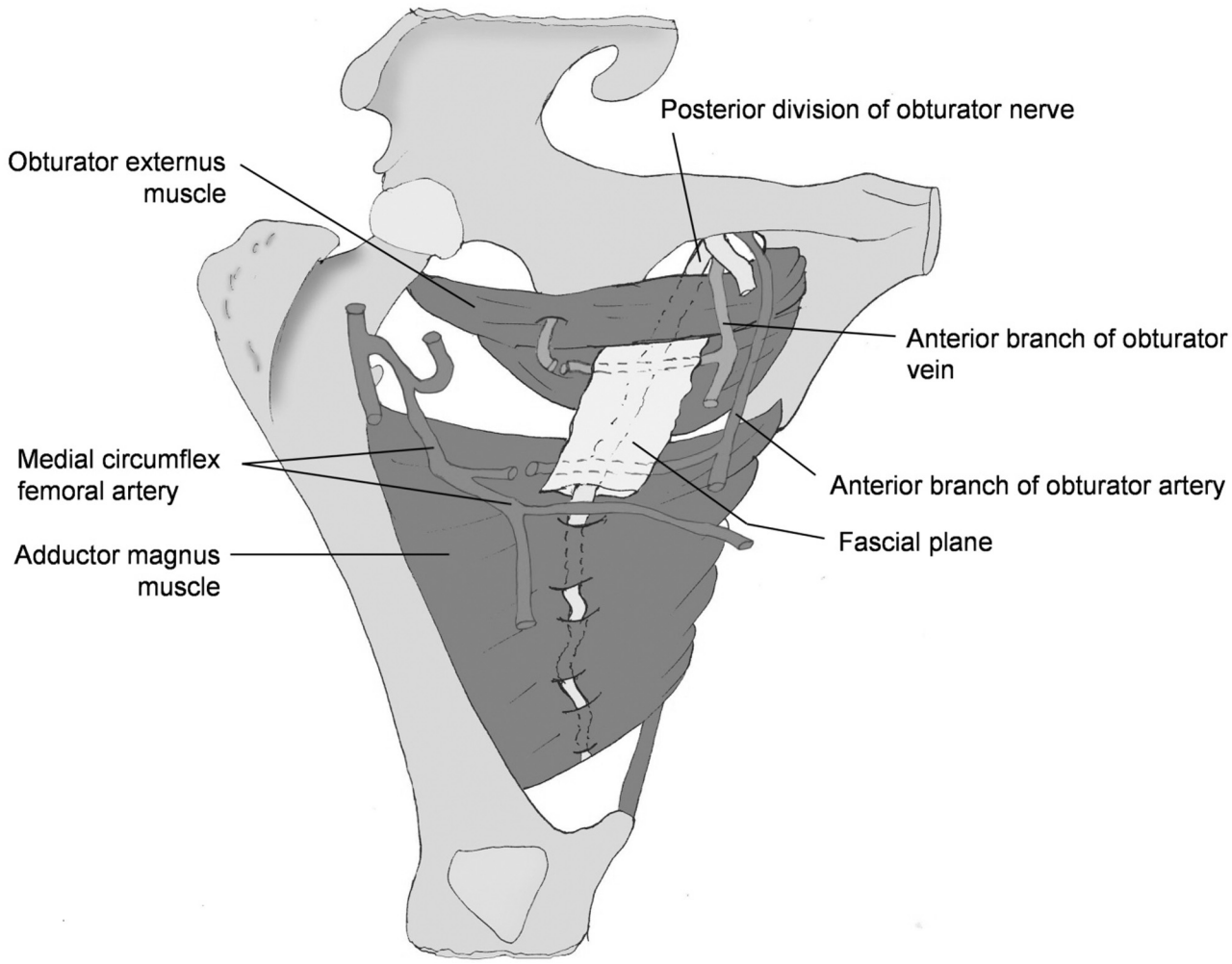
ior division sent nerve branches to the obturator externus, the adductor brevis, and the anterior part of the adductor magnus muscles.

The posterior division of the obturator nerve was intimately applied to the vessels at two sites. In the first instance, this occurred at the obturator foramen on emergence into the thigh, where the posterior division is framed by the branches of the obturator artery and vein, and is crossed by the anastomosing vein between the anterior and posterior branches of the obturator vein. The second instance was anterior to the proximal part of the adductor magnus muscle, where the posterior division is crossed by the arterial anastomosis between the muscular branches of the medial circumflex femoral artery and the anterior branch of the obturator artery (Figure 4).

Discussion

Detailed knowledge of the anatomy of the medial thigh region and the morphological variants of the obturator nerve is essential to understanding, diagnosing, and effectively treating patients with chronic groin and lower limb pain. Several reports have remarked upon the "growing appreciation of the importance"[20] of a detailed understanding of the anatomy of the obturator nerve in order to localize this nerve and its branches, and thus facilitate, for example, ultrasound guided obturator nerve block,[14–18,20] MRI[17,21] and ultrasound guided biopsy.[22] For example, Akkaya et al. (2009), in order to develop a new approach for obturator nerve block in patients, first described, in

Figure 4 *The posterior division of the obturator nerve descends within the fascial plane overlying the obturator externus and the proximal part of the adductor magnus muscles. The vascular branches of the obturator and medial circumflex femoral vessels cross the posterior division of the obturator nerve.*



cadavers, the anatomical location of the common obturator nerve and its anterior division. A triangular region bordered by the superior pubic ramus, posterior margin of the pectineus muscle and anterior aspect of the external obturator muscle containing the obturator vessels and nerve was defined and later used clinically to perform obturator nerve block with ultrasound guidance.[14]

There are several reports of the "low visibility rate" of the posterior division of the obturator nerve, possibly as a result of its variability, small size and deep location in the obturator region.[15,16,19] Our description of the variable course and the critical sites of entrapment of the posterior division of the obturator nerve would aid in identification of the nerve's ultrasound appearance, and therefore facilitate localization of this nerve for successful regional block.

Intrapelvic and obturator courses of the obturator nerve

Although an academic description[24] of the pelvic course of the obturator nerve and its passage through the obturator canal into the medial thigh has been published, nei-

ther morphological variation of the origin, the passage of the posterior division, nor the most susceptible sites of its compression were previously described in detail. Information regarding the sites of the obturator nerve bifurcation into anterior and posterior divisions is sparse, inconsistent and controversial.

Several studies have been published that describe various sites at which the obturator nerve branches into anterior and posterior divisions : a) near the obturator foramen,[6,25] b) within the obturator canal,[26,27] c) at the exit from the obturator canal,[28] and d) at the proximal border of the adductor brevis muscle.[29] In a recently published study on anatomic variations of the obturator nerve in the inguinal region,[16] the branching points of the obturator nerve into the anterior and posterior divisions were reported as: intrapelvic – 23.22%; within the obturator canal – 51.78%; in the thigh – 25%.

Bradshaw illustrates the passage of the obturator nerve through the fibro-osseous tunnel, the roof of which is formed by the obturator groove of the pubic bone, and the floor of which consists of the internal and external obturator muscles and their covering fascias.[2] Within this tunnel, the nerve divides into two main branches, as well as a branch to the external obturator muscle**.** At the distal end of the tunnel, the nerve passes through the "obturator foramen" to enter the thigh.

In our study we describe the passage of the obturator nerve via the obturator canal, not the "obturator foramen,"[2] since the obturator groove is converted to a canal by the superior margins of the obturator membrane and the obturator muscles. We also conclude that the point of the obturator nerve bifurcation is variable: intrapelvic, at the entrance of the obturator canal, or within or at the exit of the obturator canal, and is the object of a separate investigation. Clinically, in the case of bifurcation prior to the obturator canal, it is possible that either the anterior or posterior obturator divisions might then be individually involved by pathological processes; otherwise the entire obturator nerve would be affected. Contrary to the opinion that "no pelvic structures are supplied by the obturator nerve,"[26] we found that in most cases the intrapelvic obturator nerve gives off a nerve branch to the obturator externus muscle (named the nerve to obturator externus muscle), as well as periosteal and perivascular nerve branches. As a result, the contents of the obturator canal include anterior and posterior obturator nerve divisions directly related to the pubic groove, and the nerve to obturator externus muscle situated between the obturator vessels.

The presence of the obturator vessels alongside the obturator nerve divisions within the obturator canal may increase the risk of injury to these structures, for example during anesthetic procedures.[16] Detailed knowledge of regional anatomy is required when exploring new techniques. Thus the use and popularity of a new technique, tension-free vaginal tape, "has led to significant vascular and bowel injuries that may have been avoided with improved familiarity" with obturator region anatomy.[30]

At the level of the obturator canal/foramen, a lesion (e.g., obturator hernia) of the posterior division of the obturator nerve could also entrap the obturator artery or its branches. Since the femoral head is supplied by an acetabular branch (artery to head of femur, in ligament) of the obturator artery,[26] avascular necrosis of the head of the femur could be a comorbidity of entrapment of the posterior division of the obturator nerve.

Extrapelvic course of the obturator nerve

The literature concerning the further course of the posterior division of the obturator nerve in relation to the obturator externus muscle is controversial; in most cases it focuses on the anterior division of the obturator nerve. Some anatomy atlases and studies illustrate the anterior and posterior divisions of the obturator nerve leaving the pelvis via the obturator canal, above the superior border of the obturator externus muscle, and descending anterior to it.[6,31–33]

Others demonstrate the anterior division descending superficial to the obturator externus muscle, and the posterior division traversing the midpoint of the same muscle and running downward, behind the adductor brevis and in front of the adductor magnus muscles.[2,24,25,26,28,32,34] Bardeen illustrates the superior fascicles of the obturator externus muscle separated from the main belly by the "deep branch" of the obturator nerve.[29] Harvey and Bell, investigating obturator neuropathy, provide a detailed description of the course and variation only for the anterior obturator division[6]. It was reported that in one lower limb the anterior division of the obturator nerve was accompanied by the posterior division of the same nerve through the superior portion of the obturator externus muscle. In four other lower limbs, the anterior and posterior divisions of the obturator nerve emerged into the thigh above

the obturator externus, and then the posterior division passed back through the substance of this muscle to reach its deep surface. It is also reported that on entering the medial compartment of the thigh, the posterior division descends posterior to the obturator externus muscle.[27]

Given the importance of the relationship between the posterior division and the obturator externus muscle as one of the possible causes of posterior division neuropathy, we identified the following classes of variations: i) the posterior division of the obturator nerve passes over the musculotendinous aponeurotic arch, anterior to the obturator externus muscle (32 out of 56), ii) the posterior division of the obturator nerve emerges from the proximal quarter of the substance of the obturator externus muscle, perforates it and descends anterior to its distal part (22 cases out of 56), iii) the posterior division descends entirely posterior to the obturator externus muscle, emerging from its inferior border (2 cases out of 56).

Medial thigh course of the obturator nerve

In recent years, more and more studies have examined sonographic imaging of the obturator nerve's divisions in the proximal medial thigh region.[18,19] In all cases, the anterior division was easily visualized by ultrasound. However, the posterior division of the obturator nerve exhibited lower visibility since the nerve was situated within the thick fascial plane.[19] It was noted that the fascia overlying the short adductor muscle is separate from the intermuscular fascial septa which is not described in any anatomy textbooks as a distinct layer.[2]

It is reported that the posterior division in the proximal medial thigh pierces and supplies the obturator externus muscle. Then it passes anterior to the adductor magnus muscle, dividing into branches to adductor magnus and occasionally the adductor brevis. Its terminal articular branch, traversing the adductor hiatus, enters the popliteal fossa to supply the articular capsule, cruciate ligaments, and synovial membrane of the knee joint.[2,24,25]

In our study, we described the passage of the posterior division of the obturator nerve in the medial thigh region within the distinct fascial layer overlying the obturator externus and the proximal part of the adductor magnus muscles. This suggests that during ultrasound-guided posterior division obturator nerve block, the local anesthetic should be injected into the intermuscular fascial plane of the proximal one third of the medial thigh region.

Muscular nerve branches of the posterior division of the obturator nerve perforate the fascial layer in order to supply the obturator externus, adductor brevis, and anterior part of the proximal adductor magnus muscles, and may be susceptible to entrapment at the points of perforation. This hypothesis is supported by several reports that anatomic relationships between the anterior division of the obturator nerve and its accompanying fascia appear sufficient to result in entrapment syndrome.[1,2,35]

Obturator neuropathy is a form of focal nerve entrapment not only by the fascia but also by vascular structures.[1,2,23] In our study, we have described the possible sites of entrapment of the posterior division by the branches of the obturator and medial circumflex femoral vessels as they cross the posterior division of the obturator nerve at the obturator foramen and anterior to the proximal part of the adductor magnus muscle.

Since the posterior division of the obturator nerve terminates within the fibrous capsule of the knee joint, pathologies from the hip (e.g., slipped capital femoral epiphysis) may refer pain to the knee[36]. Clinicians should be aware of this unique relationship and include hip pathology on the differential diagnosis of the painful knee. The precise mechanisms and the sites of entrapment resulting in obturator neuropathy are unclear. Several studies have provided evidence of the problems related to the anatomic placement of this nerve. The nerve may be compressed within the true pelvis from pelvic fractures, by pelvic hematomas secondary to trauma, and by intrapelvic tumors.[37,38] Local inflammatory or infectious processes in the adjacent pubic bones may spread laterally to involve the region of the obturator foramen causing "obturator tunnel syndrome ".[10]

The entrance to the obturator foramen has been proposed as the site of obturator nerve entrapment where both divisions were damaged.[39] Clinical, electrophysiological, and surgical findings suggest that the entrapment may occur at the level of the obturator foramen and proximal thigh rather than in the obturator tunnel.[2] Other diagnostic possibilities include obturator hernias which have been associated with obturator nerve entrapment.[7,13,38,40,40,41]

Conclusion

Considering the anatomical passage of the posterior division of the obturator nerve, and taking into consideration accompanying fascial and vascular structures, we

conclude that the course of the posterior division of the obturator nerve places it at risk of compression at the following sites:

i) within the obturator canal, by the vascular bundle of the obturator vessels or for other reasons described in the literature (complications of gynecological or orthopaedic surgery, inflammatory changes in the adjacent pubic bone in osteitis pubis, obturator hernia);
ii) in the fibromuscular canal formed by the anterior surface of the obturator membrane and the posterior surface of the obturator externus muscle;
iii) in the muscular tunnel where the posterior division perforates the obturator externus muscle;
iv) within the distinct fascial plane situated deep to the pectineus and adductor brevis muscles, and superficial to the obturator externus and the proximal one-third of the adductor magnus muscles.

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Statin induced myopathy presenting as mechanical musculoskeletal pain observed in two chiropractic patients

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Lipid lowering drugs, such as statins, are commonly used to treat approximately 10 million Canadians affected by hypercholesterolemia. The most commonly experienced side-effect of statin medication is muscle pain. Statin induced myopathy consists of a spectrum of myopathic disorders ranging from mild myalgia to fatal rhabdomyolysis. The following is a presentation of 2 cases of statin induced myopathy in patients presenting in a chiropractic setting. In addition, discussion will surround the mechanism, predisposing risk factors and frequency of statin induced myopathy while highlighting the role that chiropractors and other manual therapists may play in its recognition and management.
(JCCA 2010; 54(1):43–51)

KEY WORDS: statin, adverse events, myopathy, myalgia, myositis, rhabdomyolysis, chiropractic.

Les hypolipidémiants, tels que les statines, sont utilisés couramment pour traiter environ 10 millions de Canadiens touchés par l'hypercholestérolémie. L'effet secondaire des statines ressenti le plus souvent est la douleur musculaire. La myopathie provoquée par les statines consiste en un spectre de désordres myopathiques allant de la myalgie légère à la rhabdomyolyse mortelle. Voici une présentation de 2 cas de myopathie provoquée par les statines chez des patients d'un contexte chiropratique. En outre, la discussion portera sur le mécanisme, les facteurs de risque prédisposants, et la fréquence de la myopathie provoquée par les statines, tout en soulignant le rôle que peuvent jouer les chiropraticiens et autres thérapeutes manuels dans la reconnaissance et la gestion de celle-ci.
(JCCA 2010; 54(1):43–51)

MOTS CLÉS : statines, événements indésirables, myopathie, myalgie, myosite, rhabdomyolyse, chiropratique.

Introduction

Roughly 10 million Canadians and 106.7 million Americans suffer from hypercholesterolemia.[1,2] As a result, these individuals are at increased risk for atherosclerosis, stroke and heart disease.[1] Current Canadian guidelines recommend lifestyle modifications (Table 1) and statin therapy for the treatment of dyslipidemia and coronary artery disease (CAD).[3] Statins have consistently been shown to reduce cardiovascular related mortality and morbidity through the reduction of low density lipoproteins (LDL).[4–10] This has led to a trend of increased statin usage over the past two decades, represented in Canada

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Table 1

Current Canadian guideline recommendations for the treatment of dyslipidemia and CHD[3]

- suggest lifestyle management
- smoking cessation
- limiting the intake of saturated fats and refined carbohydrates
- maintenance of a body mass index (BMI) less than 27 kg/m^2
- participating in 30 to 60 minutes of moderate exercise at least four days per week

whereby usage rates rose from 1.6% in 1994 to 7.8% in 2002.[11] In 2004, approximately 24 million Americans were taking statin medications.[12]

Of considerable interest, the long-term cardiovascular benefits achieved with prolonged statin therapy may be attained without significant negative sequelae.[13–15] This observation has resulted in recommendations for the sale of statins over-the-counter in the United States.[16,17] The premise of such a move is to improve accessibility to the public, and hopefully increase usage, thereby lowering rates of cardiovascular pathology. Of concern however is that patients are unlikely to know if and when they require intervention and are not likely to receive adequate lifestyle education. In addition, un-prescribed public use reduces the ability to monitor effects, both positive and negative, of administering such a medication in the context of a broader treatment plan. These concerns have resulted in the rejection of over-the-counter (OTC) status being granted to Mevacor by the US Food and Drug Administration a total of three times.[18] Despite these concerns however statins are currently available over-the-counter in the United Kingdom.[19]

While rare, side-effects of statin therapy exist in the form of renal disease, hepatopathology, neuropathy and death.[20–29] The most common side-effect in statin users is myopathy which includes a spectrum of myogenic disorders ranging from mild myalgia to fatal rhabdomyolysis.[24] The concern regarding rhabdomyolysis resulted in a Health Canada Advisory in 2005 warning patients, physicians and pharmacists about this rare, but serious spectrum of muscle disorders.[30] From this point forward the myopathic spectrum will be referred to as statin induced myopathy (SIM).

The following is a presentation of two cases in which patients presented to a chiropractic setting complaining of diffuse and generalized muscular pain. During historical examination it was discovered that both patients were concomitantly using cholesterol lowering medication. As the initiation of statin medication coincided with the onset of musculoskeletal symptoms and pain could not be mechanically classified through clinical testing, SIM was suspected.

Case 1

A thirty-four year old female presented to a chiropractic teaching clinic with neck pain of undetermined duration, along with a seven month history of bilateral lower leg and knee pain. Health history included type 1 diabetes, progressive retinopathy, managed hypertension, previous episode of frozen shoulder, trigger finger and nephropathy. Medications included eprex, levothyroxine sodium and fluoxetine for non-specified durations and 80mg atorvastatin daily for seven years. Blood pressure was measured at 122/80 on the right arm.

Knee and lower leg pain was aggravated by lying down, with increased severity at night. Lower leg pain was described as a burning and cramping sensation, worse on the right. Subjective weakness was described in knee extension and ankle dorsiflexion bilaterally.

Lower limb pulses were palpable and symmetric bilaterally. No trophic changes were observed. Sensory testing of the lower limbs was normal with the exception of a subjective decrease in sharp and dull discrimination on the right medial malleolus. Lower limb reflexes were 2+ bilaterally. Extensor hallucis longus on the right demonstrated 4/5 strength. Vibration testing and position sense was normal in the great toe bilaterally. A bilateral straight leg raise of 90º was achieved with hamstring tightness.

Knee range of motion revealed a flexion restriction to 90º bilaterally and full extension with 'pulling' created in the popliteal fossa. Medial joint line tenderness was elicited via digital pressure within the tibio-femoral joints bilaterally. Palpation revealed tenderness in the distal iliotibial band, quadriceps tendons, tibialis anterior and peroneals. Despite these findings however the chief lower limb complaint could not be recreated with physical examination.

Neck pain was aggravated by sitting postures and relieved by massage. Cervical nerve root tension tests were negative. Cervical range of motion was decreased 25% in lateral flexion bilaterally and associated with contra-lateral tightness. Rotation to the left was decreased 25% compared to the right. Extension-rotation positions produced posterior neck pain bilaterally. A painful motion restriction was found at C2–3 on the right. Palpatory tenderness was also elicited in the trapezius and levator scapulae bilaterally. Cervical pain was recreated with range of motion and palpation. Hyperalgesia was also noted in the lumbar spine erectors and gluteal muscle group bilaterally.

The patient was diagnosed with cervical facet joint dysfunction and a possible statin induced myopathy contributing to lower leg symptoms. Treatment for the neck pain included soft tissue therapy and joint mobilization. The patient was advised to consult with her physician regarding statin medication and muscle pain.

The patient returned for a follow-up visit seven days later and confirmed that she had ceased statin medication and had not felt leg cramping for four nights. Confirmatory blood tests were not obtained however as this decision was made without the aid of her family physician. Shortly thereafter, she was placed on rosuvastatin at an unidentified dosage. Symptoms returned more severely than the first episode, prompting another self-directed discontinuation of medication. The patient was seen three more times at which point lower leg cramping symptoms had discontinued and the diagnosis was shifted towards pes anserine bursitis. The patient was subsequently lost to follow-up.

Case 2

A seventy-six year old female presented to a private chiropractic office as a returning patient with a new complaint of lower thoracic paraspinal pain. No specific incident occurred at the time of onset, but the patient had been travelling, spending several hours sitting, interspersed with carrying suitcases. The pain had come on over several hours, but then remained present for several days. Morning hours were the most difficult. Initiating activity was accompanied by pain and stiffness. The intensity of the pain was significant enough to stop the patient from engaging in activities and she described the intensity as more painful than her preceding complaints.

Health history was unremarkable except for the prior back pain and one episode of angina, four years prior. The patient indicated that she was on simvastatin for the treatment of elevated cholesterol for several months. Previous complaints included low back pain and neck pain which had responded with resolution in one-to-three visits.

On physical examination, combined range of motion of the lumbo-thoracic spine was full, with pain at end range of flexion, extension and left rotation. Posterior joint provocation tests were mildly positive on the left side. Palpation revealed significant tenderness and tightness in the paraspinal muscles throughout the lower thoracic and upper lumbar regions. Pressure to the left paraspinal muscles reproduced her complaint. No abdominal tenderness was present. Lower limb neurological evaluation was within normal limits.

Plain film radiographs revealed mild osteopenia, with very mild degenerative changes.

The patient was diagnosed with mechanical back pain and treated with mobilization and interferential current for pain. Soft-tissue therapy was also incorporated. Symptoms improved for one to three days, but the pain and stiffness returned. Lack of sustained improvement raised the suspicion of statin-related myalgia. The chiropractor, with the patient's permission, discussed the issue with the woman's daughter, a nurse, who accompanied the patient on a visit. The daughter had also wondered about this possibility. The patient was referred to her Family Physician, who changed the statin to another equivalent medication, atorvastatin.

Within one week of the medication change, the symptoms were diminished to the extent that the patient could re-engage in most activities, including gardening. The complaint resolved within two weeks. The patient did have further complaints for which she returned to the chiropractor's office. However, subsequent episodes responded well to two-to-three visits with resolution of pain for several months to years.

Discussion

The mechanism of statin medication

Lovastatin (Mevacor), produced by Merck & Co. Inc. in

1987, was the first statin to be commercially marketed. To date, the statin drug family has grown to include atorvastatin (Lipitor), cerivastatin (Baycol), fluvastatin (Lescol), pravastatin (Pravachol), rosuvastatin (Crestor) and simvastatin (Zocor). Baycol was withdrawn from the market in 2001 due to its increased association with fatal rhabdomyolysis.[31]

Statins, otherwise known as HMG-CoA reductase inhibitors, decrease de novo cholesterol biosynthesis by blocking the rate-limiting step in cholesterol synthesis. By countering HMG-CoA synthase, statins block the formation of mevalonic acid, which is a precursor to all steroids, including cholesterol. This stimulates the liver to increase the number of LDL receptors and draw LDL from the blood for the purposes of bile production. [31,32]

The effectiveness of statin intervention for dyslipidemia

The Scandinavian Simvastatin Survival Study was the first major study on long term statin effectiveness. The study followed over 4000 patients for five years; it found that those receiving statin therapy demonstrated reductions in total serum cholesterol levels by 25% and LDL cholesterol levels by 35% when compared to the control group. In addition, the study group demonstrated a lower relative risk of all cause mortality (RR of 0.70) compared to controls.[33] This publication was a landmark study in the field of cardiovascular related health.

Statins have consistently shown positive results in the secondary prevention of cardiovascular mortality in both meta-analysis and systematic review.[34,35] Recently, the effectiveness of statins on the primary prevention of cardiovascular mortality was addressed in a meta-analysis that included data on 65,000 patients. The authors concluded with statistical significance that statin users showed a relative risk of 0.93 for all-cause mortality, 0.89 for cardiovascular-related deaths, 0.85 for major cardiovascular events and 0.77 for myocardial infarction, when compared to controls.[36]

Canadian guidelines for the treatment of dyslipidemia

A patient's risk profile for CAD is assessed via the Framingham Heart Score (FHS) which, when combined with known comorbidities, is used to classify patients as being at either high-, moderate- or low-risk for experiencing a major cardiac event within the next 10 years. The FHS is then combined with the patient's blood-lipid profile to determine therapeutic options. Readers are encouraged to review the Canadian guidelines for the diagnosis and management of dyslipidemia for more information on this scoring system.[3]

Lifestyle modifications in the form of smoking cessation, improved dietary intake and exercise therapy should be the primary intervention tool. However, statin therapy is recommended for patients that require medical assistance to adequately reduce their risk for CAD by reaching target LDL levels. Also, an LDL reduction of at least 50% is required to prevent progression of atherosclerosis in patients with established CAD. Statin monotherapy is likely to be sufficient in achieving this reduction for most patients, however increased statin dosage, or combination therapy with other pharmaceuticals, is recommended for those not achieving target levels. [3]

The mechanism of myopathy

Many mechanisms of SIM have been proposed. Theories range from altered mitochondrial respiration and derangement of cellular membranes, to the depletion of isoprenoids which control myocyte apoptosis.[24] One theory suggests that as statins increase tyrosine phosphorylation the resulting increase in cytosolic calcium causes apoptosis.[37] Another theory surrounds ubiquinone (coenzyme Q10) which contributes to the electron transport chain and mitochondrial respiration, therefore depletion could result in aberrant cellular metabolism. Ubiquinone is also responsible for GTP activation, helping to bind regulatory proteins.[38] Additional research points to altered ratios of lactate and pyruvate in statin users, representing a decreased reliance on aerobic metabolism.[39]

It should also be considered that polypharmaceutical interactions or altered cellular pathways via defects in genetic processes could result in a higher systemic bioavailability of statins, therefore augmenting adverse events.[40]

While many theories attempt to explain the mechanism of SIM, the true pathophysiology remains unknown. Therefore, without fully understanding the physiological cause of an adverse drug reaction, it is difficult to offer adequate prevention strategies.

This being said, a thorough understanding of the mechanism is important in order to accurately grasp the clinical

picture. This is especially true for the manual therapist who simply wishes to know 'how does this result in pain?' As previously alluded, many theories involve concepts of cellular respiration and the apoptotic control pathways, which may result in chemical/ischemic nociceptive stimulus.

Risk factors for developing SIM

While difficult to determine prevention strategies, certain risk factors have been identified that may predispose an individual to developing SIM. These include older age (with a higher prevalence in females), preexisting liver or renal impairment, hepatic fatty changes (consider this in patients with a history of alcoholism), hypothyroidism, a history of drug abuse, trauma, heavy exercise, ischemic scenarios and concomitant use of fibrates or corticosteroids.[25,26,41–43] In fact, the concurrent use of gemfibrozil (Lopid), a fibric acid derivative, was associated with 1/3 of rhabdomyolysis related deaths in patients using cerivastatin.[29]

A large observational study found that the risk of a myopathic event occurring in a diabetic patient was twice that of a non-diabetic patient.[42] This may correlate with case 1, whereby the patient had type 1 diabetes. Diabetic status however has been found to have no effect on the risk of developing rhabdomyolysis. [42]

The spectrum of myopathy

Published literature offers many definitions for myopathy. As a result, an attempt at standardization by the American College of Cardiology, American Heart Association and the National Heart, Lung and Blood Institute was made, resulting in the following terminology:[44]

- Myopathy: having to do with any disease of the muscle (non-specific)
- Myalgia: muscle ache or weakness without an elevation in blood creatine kinase (CK) levels
- Myositis: muscle symptoms that are associated with elevations in blood CK levels, upwards of ten times the normal upper laboratory limit
- Rhabdomyolysis: muscle symptoms associated with marked elevations in blood CK levels, significantly greater than 10 times the upper limit of normal and typically associated with myoglobinuria

Brought forth by similar concerns and increasing negative attention, the National Lipid Association established a Statin Safety Assessment Task Force (SSATF) charged with evaluating the effects and safety of statin therapy. One such panel, composed of muscle experts, sought to clarify definitions associated with statin myopathy as well as causative factors and management strategies.[25]

While supporting the previously mentioned definitions, the task force recommended further clarification. It was recommended that myopathy be categorized into symptomatic and asymptomatic forms (relating to elevated or non-elevated CK levels). It was also recommended that rhabdomyolysis be classified into mild (normal – <10 times normal), moderate (10 times – <50 times normal) and marked (over 50 times normal) in reference to CK elevations. Improved nomenclature based on laboratory analysis would help clinicians make more appropriate assumptions regarding the extent of muscle damage in such cases. It was also thought that new terminology would result in improved reporting of adverse events during clinical trials, including milder forms of myopathy.[25]

With regards to the presented cases, CK levels were unavailable as confirmatory blood tests were not obtained by either patient. In the example of case 1, the patient discontinued statin therapy without physician guidance and was lost to follow-up shortly thereafter. In the example of case 2, though physician guidance was sought, communication was unavailable during the time of care and the patient later became lost to follow-up.

Clinical Presentation

Unfortunately, the clinical presentation of SIM is not well described within the literature. Reports in large scale studies typically detail proximal muscle pain, weakness, myalgia, generalized aching, nocturnal cramping, diffuse or crampy pain and fatigue.[24] Case descriptions of SIM would be more valuable to manual practitioners with the inclusion of full physical examination findings such as range of motion, manual muscle testing, patient response to passive stretching, and palpatory findings. More thorough case descriptions would potentially allow clinicians to differentiate presentation and determine the likelihood of SIM in their own practice setting, though this theory is only speculative. While there has been minimal report given to physical examination findings, the timeline associated with the onset of therapy and symptom presentation has been discussed. A retrospective review of 45 SIM

patients revealed a mean onset of symptoms at 6.3 months following statin initiation, with a range between 1 week and 4 years.[45]

There is one report in the chiropractic literature of rhabdomyolysis secondary to the use of protease inhibitors for HIV infection. The patient was also taking an unidentified lipid lowering drug at 200mg/day. Rhabdomyolysis was diagnosed upon hospitalization following three days of muscle weakness and an inability to walk. This case however focuses on the link between rhabdomyolysis, medications and risk factors rather than differentiating a clinical presentation.[46]

The cases described in this report indicated that the patient history and description of pain were the most likely indicators of SIM being included in the differential diagnosis. In the first case, despite palpation revealing tenderness within the local musculature, the primary complaint was not provoked and therefore could not be classified orthopaedically. In this case, it was the patient's history and description of ischemic type pain that led to SIM as a differential diagnosis. In the second case, while palpation of local musculature did recreate the chief complaint, the patient's response did not adequately compare with treatment expectations. As a result, re-evaluation with historical consideration considered SIM as a differential diagnosis.

The Frequency of Statin Myopathy

Prevalence estimates of SIM have been variable. One study reported 5150 cases of minor muscle pain per 100,000 patient years, 97 cases of myopathy and 4.4 cases of rhabdomyolysis.[24] The PRIMO study, which included 8,000 patients receiving high-dose statin therapy for hyperlipidemia, found that muscular symptoms were reported in 10.5% of the subjects. Symptoms developed within a median time of one month following therapy initiation and prevented moderate exertion in 38% of patients, causing 4% to become bedridden.[23] The Heart Protection Study reported mylagia in 7% of patients, though no significant difference was noted between intervention and control groups.[5] Other reports place significant myopathic symptoms occurring in less than 0.5% of statin users.[22] A more recent cross-sectional analysis of 3,580 adults found that 22% of statin users experienced musculoskeletal pain in the previous 30 days compared to 16.7% of non-statin users, placing users at an adjusted odds ratio of 1.5 for experiencing musculoskeletal pain.[47]

Given this variability, the SSATF conducted a review of twenty-one independent clinical trials, concluding that while muscular symptoms are the most prevalent side-effect of statin use they are rare.[48] The Task Force concluded that up to 3% of patients taking statins will experience myalgia and five patients per 100,000 person years will experience myositis. More serious rhabdomyolysis is estimated to be a risk in 1.6 patients per 100,000 person years with a 10% fatality rate.[48]

Patient Monitoring

Baseline testing of CK levels should be conducted in patients at high risk for SIM to establish a reference point and prevent the inappropriate discontinuation of effective therapy.[26] Asymptomatic elevations are common and often benign, therefore routine CK testing is not recommended.[25] In addition, continuation of statin therapy is suggested in those patients experiencing tolerable myalgia and no greater than a mild CK elevation, given the benefits. This being said, symptomatic patients must be monitored closely to gauge the degree of muscle damage and determine prognosis. [25]

This monitoring of myopathic symptoms is an important role that manual therapists can fulfill. One example of this role is in the higher frequency of visits typically experienced within a manual therapy treatment plan as compared to medical management. Clinicians have an increased opportunity for follow-up questioning and the assessment of signs and symptoms. In addition, if during the course of a management plan, treatment progress is not meeting expectations or fails to match the natural history of the suspected diagnosis (muscle strain, myofascial pain, etc.) an alternate cause for the myopathic symptoms should be sought. An appropriate referral can be made if myopathic symptoms become questionable in cause or appear to be progressing.

Treatment of statin myopathy

Pending the exclusion of other known causes of myopathy, such as substance abuse and hypothyroidism, the general treatment approach is statin discontinuation.[24] Patients experiencing tolerable myalgia however without CK elevation, may continue therapy at the same or reduced levels with careful monitoring. Meanwhile if CK levels increase or myalgia progresses to an intolerable level, statin use should be discontinued under the

physician supervision. Once the patient is asymptomatic, statin therapy may be reinitiated at a reduced dose. This will help to determine causation versus temporal association as well as a possible dose-dependant threshold.[25,28,38]

In the event that a patient is suffering from rhabdomyolysis, statins should be discontinued immediately and the patient should be hospitalized. Intravenous hydration and alkalinization is the primary treatment with the clinical goal in such instances being to immediately cease muscle degradation and prevent further release of myoglobin into the blood stream, limiting the extent of renal damage.[24] Given the severity of the consequences, the role of the manual therapist would be to refer the patient to the emergency room when rhabdomyolysis is suspected.

Conclusion

While the spectrum of myopathy is a rare complication of HMG-CoA reductase inhibitors, myopathic symptoms represent the most commonly experienced side effect.[48] As dyslipidemia is a highly prevalent cardiovascular disorder, many patients presenting in a chiropractic setting may be taking medication in the statin family.

As always, a thorough health history and comprehensive physical examination should be performed in all patients presenting with musculoskeletal complaints. For those patients presenting with diffuse and crampy musculoskeletal pain while concurrently taking statin medications, SIM must be considered and explored. Suspicion should increase if pain cannot be classified orthopedically/mechanically. In addition, the spectrum of myopathy represents an excellent example of how frequent re-evaluation following a trial of therapy is essential to patient care. In the event that patients are not responding as expected, or if symptoms are progressing, differential diagnoses must be explored.

When SIM is suspected, it is essential to recommend that the patient follow-up with his or her medical doctor for further laboratory analysis and to discuss the potential of modifying pharmacotherapy.

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Jurisprudence and business management course content taught at accredited chiropractic colleges: A comparative audit

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Introduction: *the purpose of this study was to conduct a comparative audit of the jurisprudence and business management courses offered at a number of different accredited chiropractic colleges.*

Methods: *Faculty members responsible for teaching students jurisprudence and/or business management courses at a number of accredited colleges were contacted and asked to electronically submit their course outlines for review.*

Results: *Of the 62 different topics delivered at the 11 chiropractic colleges surveyed, not one topic was taught at all of them. The following topics were taught at 10 of the 11 respondent chiropractic colleges: business plan development; ethics and codes of conduct and; office staff/employees. Several topics were only taught at one accredited chiropractic college.*

Conclusion: *While most chiropractic colleges provide some education in the areas of jurisprudence and business management, it would appear that there is no consensus opinion or 'model curriculum' on these topics towards which chiropractic programs may align themselves. Based on a literature search, this study is the first of its kind. A more extensive study is required, as well as a Delphi process to determine what should be taught to chiropractic students with respect to jurisprudence and business management in order to protect the public interest.*

(JCCA 2010; 54(1):52–59)

KEY WORDS: jurisprudence, management, college, curriculum, chiropractic.

Introduction : *cette étude avait pour objet de procéder à une vérification comparative des cours de jurisprudence et de gestion des affaires offerts dans plusieurs collèges chiropratiques agréés.*

Méthodes : *les membres de la faculté responsables de l'enseignement de la jurisprudence et/ou la gestion des affaires dans plusieurs collèges agréés ont soumis par voie électronique leurs plans de cours à des fins d'analyse.*

Résultats : *parmi les 62 sujets enseignés dans les 11 collèges chiropratiques ayant participé à l'étude, aucun sujet n'était enseigné dans tous les établissements. Les sujets suivants étaient enseignés dans 10 des 11 collèges chiropratiques répondants : élaboration d'un plan d'affaires, codes d'éthique et de conduite, et employés/personnel de bureau. Plusieurs sujets n'étaient abordés que dans un seul collège chiropratique agréé.*

Conclusion : *bien que la plupart des collèges chiropratiques enseignent des notions de jurisprudence et de gestion des affaires, il ne semble pas y avoir de consensus ou de « programme d'études modèle » relativement aux sujets qui doivent être abordés par tous les programmes de chiropratique. Selon les recherches effectuées dans la documentation, cette étude est la première en son genre. Une étude plus approfondie et un processus delphique s'avèrent nécessaires pour déterminer ce qui doit être enseigné aux études en chiropratique relativement à la jurisprudence et la gestion des affaires afin de protéger les intérêts du public.*

(JCCA 2010; 54(1):52–59)

MOTS CLÉS : jurisprudence, gestion, collège, programme d'études, chiropratique.

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"I will sell Chiropractic, serve Chiropractic, and save Chiropractic if it takes me twenty lifetimes to do it. I will promote it within the law, without the law, in keeping with the law, or against the law in order to get sick people well and keep the well from getting sick."

BJ Palmer c1910

Introduction

One hundred years ago, BJ Palmer recognized the interface between clinical practice activities and jurisprudence, even going so far as to express a certain degree of disdain for the law in favor of promoting the profession. And while perhaps such a cavalier attitude towards government oversight was necessary given the context of the nineteenth century- a time when chiropractors were under siege and often jailed for practicing 'medicine without a license' – the advance of the profession's position in the health care delivery system since that time would argue in favor of a more prudent approach to adhering to the legislation, regulations, standards of practice and policies that govern chiropractic practice activities.

More recently, attendees of the 2009 Association of Chiropractic Colleges and Research Agenda Conference (ACC-RAC) can attest to the observation that virtually all keynote, plenary and panel presenters spoke to the importance of regulation in chiropractic. Indeed, virtually every speaker emphasized that advancement in the cultural authority of the profession can only be achieved if all licensing bodies exercise their legislative authority and were ever-vigilant with respect to disciplining chiropractors who operated at the fringe of the profession, especially in terms of unethical practice activities.

One method in determining whether or not a health care discipline has secured its cultural authority is by considering its statutory authority with respect to the privilege of self-regulation. Although it may sound trite, self-regulation is a privilege and not a right and if this privilege is not handled with the appropriate degree of gravitas it requires, then this privilege can be revoked, as was the case with respect to the profession of law in the United Kingdom where government regulators perceived the legal profession was acting more as an advocacy group and less as a regulatory body.[1] Imagine the horror for the chiropractic profession if that were to happen to it – if government regulators were to withdraw the privilege of self-regulation for chiropractors and appoint other health care providers (medical doctors, for example) as overseers of the profession or, worse still, if bureaucrats were given the responsibility of regulating chiropractic 'in the public interest.'

Fortunately, many jurisdictions have in place governing legislation bestowing the privilege of self-regulation to the chiropractic profession, and licensing bodies are enabled, by statute, to develop their own regulations, standards of practice, policies and guidelines with respect to a scope of practice, use of controlled acts, advertising, quality assurance initiative, prohibition against engaging in sexual relationships with patients, codes of conduct, fee schedules, billing practices, record keeping and so on. That said, in order to safeguard this privilege, it would seem imperative that, not only should curricula at accredited chiropractic colleges teach students the rules under which they must practice, but ought to be some level of standardization throughout the profession with respect to the topics taught. Since many of the principles that govern professional activities are identical regardless of the location in which a chiropractor practices and it is not uncommon for practitioners to relocate from one jurisdiction to another. At the same time, there have been a few published studies,[2–6] and considerable ruminations emanating from the field that opine chiropractic colleges do not adequately prepare students to operate a successful chiropractic practice.

Bearing all this in mind, the purpose of this study was to conduct a comparative audit of the jurisprudence and business management courses offered at accredited chiropractic colleges. Ultimately, this information may enable the development of a 'model curriculum' for jurisprudence and business management courses.

Method

This study was approved by the ERB of CMCC.

Recruitment

This author contacted academic deans or other faculty at chiropractic colleges in North America, Europe and Australia-New Zealand, using either the author's list of contacts or an Internet search of chiropractic colleges. A total of 18 colleges were contacted. Eventually the author was transferred by email to the person(s) responsible for teaching jurisprudence and business management at various chiropractic colleges (this content is often presented in the same course or by the same lecturer). Subsequently,

an internet request was made by this author that the course coordinators email a course of the outline/syllabus/curriculum of the courses in question.

Confidentiality of respondents

Respondents were guaranteed anonymity to the extent that only the author would know the identity of respondent colleges and that any published results would refer to a respondent college only as "college 1," "college 2" and so on.

Results

Although several colleges declined to participate in this study, 11 chiropractic colleges responded to the author's request. The content, in the form of topic headings, was extracted from submitted course outlines and tabulated (see Table 1). As a point of interest, a North American naturopathic college was contacted and the course coordinator of the jurisprudence and business management courses there graciously agreed to participate in this study as well. The data extracted from that college's course outline appears in Table 1 as 'College 12.' (Thus total response rate of all colleges was 66.6%).

The course outlines from a total of 9 North American chiropractic college were collected (Table 1). Two non-North American colleges participated in this study (one college from Australia/New Zealand and one from the United Kingdom), in addition to North American naturopathic college, bringing the total of respondent colleges to 12.

Upon review of the 12 course outlines submitted to the author, 62 different topics were identified as being taught during either the jurisprudence or practice management courses. Of particular interest, of the 62 different topics delivered at the 11 chiropractic colleges, not one topic was taught at all of them. That said, the following topics were taught at 10 of the 11 respondent chiropractic colleges: business plan development; ethics and codes of conduct and; office staff/employees. Conversely, only one respective chiropractic college instructed students each of the following topics: anti-kickback legislation; anti-discrimination; asset protection; estate planning; human rights/diversity; independent chiropractic exams (exams ordered by third party payors); mandatory reporting of communicable diseases and; issues related to treating patients with AIDS. Of note, a representative from one chiropractic college (college #11) wrote that there were no courses that teach 'jurisprudence' or 'business management' per se, but rather much of that conduct is embedded into course work of other courses throughout the program. Nevertheless, that representative did email this author an outline of a course entitled 'contemporary clinical and professional practice'; topic headings from that course did resemble course content from other jurisprudence and business management chiropractic courses taught elsewhere. Table 2 lists the number of colleges that teach each of the 62 topics covered by all 11 of the respondent chiropractic colleges.

As a point of comparison, the topics taught within the jurisprudence and business management courses at the naturopathic college (college #12) revealed that that program is very comprehensive, covering 37 of the 62 listed topics. Only college #2 covered more topics (47 in total).

Discussion

There are a myriad of professional options available to newly graduated chiropractors. Some enter private practice, as either sole practitioners or as associates, some join multi-disciplinary facilities, others become teaching faculty, some are drawn to research activities, and some continue with their education, entering residency programs, for example. And of course some graduates do a combination of any of these, whereas other graduates never practice as chiropractors in any capacity whatsoever. But, with the exception of not practicing at all and not maintaining their certificate of registration, graduates who engage in any other practice activity must abide by the statutory legislation that governs chiropractic within the jurisdiction they practice. However, based on the data collected from this study, there is a wide variety of topics covered by chiropractic colleges and no two colleges offer the same curricular content. Indeed, some chiropractic colleges offer a number of unique topics, not taught anywhere else at all. One can only imagine how this may frustrate a chiropractor who travels from one state to another or from one country to another.

Accrediting agencies provide some guidance with respect to what should be included in a jurisprudence and business management curriculum. One of the few documents that provide educational requirements of what must be taught to chiropractic students is the Canadian Federation of Chiropractic Regulatory and Educational Accrediting Boards (CFCREAB, sometimes simply referred to as 'the Federation') which declared:

Table 1 *Comparative audit of jurisprudence and business management courses taught at accredited chiropractic colleges (#1–#11) and one naturopathic college (college #12)*

	College											
Course content	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Accounting		■		■	■	■				■		■
Advertisement		■	■	■	■	■	■		■	■		■
Anti-discrimination/Diversity											■	
Anti-kickback					■							
Asset protection							■					
Billing codes				■		■	■	■	■			
Business plan development	■	■		■	■	■	■	■	■	■	■	■
Business structure		■		■	■		■	■	■	■	■	■
Communication with other professionals		■		■						■		■
Communication/public speaking/media										■	■	■
Complaints process		■									■	■
Computer programs		■		■			■	■				■
Confidentiality		■							■		■	
Consent/ informed consent	■	■	■	■	■		■					
Contract: associate agreements		■			■		■	■				■
Contract: lease		■			■		■	■	■			■
Contract: purchase agreements		■			■		■	■				
Contracts (unspecified)			■	■	■		■		■			■
Court and trial procedures		■	■				■		■		■	■
Defence to claims		■					■					■
Demographics (practice location)		■		■	■			■		■		■
Discipline procedure		■	■		■							■
Doctor-patient relationship		■		■	■	■						■
Equipment/ chattels/ fixtures				■	■		■	■		■		■
Estate planning			■									
Ethics and codes of conduct	■	■	■	■	■	■	■	■		■	■	■
Fee schedules/ block payments		■		■	■	■	■					
Financing (banking)	■	■	■	■	■	■		■	■	■		■
Fraud enforcements				■	■				■			
Health promotion					■						■	
Human Rights/ Equality											■	
Independent chiropractic exams (ICEs)		■										
Insurance (malpractice, life, disability)		■		■	■		■	■		■		■
Issues related to AIDS patients			■									
Malpractice		■			■			■				■
Mandatory reporting: child abuse		■	■								■	■
Mandatory reporting: communicable disease		■										
Marketing	■	■		■	■	■		■	■	■		■
Medicolegal reports		■		■	■			■				■
Multidisciplinary practices		■		■	■							
Negligence		■					■		■			■
Office layout/size		■			■			■		■		
Office policy and procedures		■	■	■		■	■			■		
Office staff/employees		■	■	■	■	■	■	■	■	■	■	■
Other agreements (managed care/diagnostic)				■			■	■	■			
Practice promotion		■		■								■
Practice management	■	■		■		■		■				
Privacy		■							■			
Products (orthotics, supplements)		■						■				■
Professional associations		■						■		■		■
Quality assurance (CE)		■			■							
Recent court decisions/issues	■	■	■									■
Record keeping	■	■		■	■		■	■	■	■		■
Referral/ dismissal procedures	■	■		■	■	■	■	■				
Scope of practice		■	■	■	■							■
Search warrants/depositions					■				■			
Sexaul abuse/boundries/misconduct		■		■	■		■	■			■	■
Sexual harassment		■			■			■				■
Sources of reimbursement (WSIB, HMOs)				■						■		
Standards/statutes	■	■	■				■		■			■
Taxes		■	■							■		■
Tort law		■							■			■

Table 2 *Number of colleges that instruct chiropractic students on generated list of 62 different topics of jurisprudence and business management (n=11)*

	Topic # of colleges that include it in course outline			Topic # of colleges that include it in course outline
Accounting	5		Independent chiropractic exams	1
Advertisement	8		Insurance (malpractice, life, disability)	6
Anti-Discrimination/Diversity	1		Issues related to AIDS patients	1
Anti-kickback	1		Malpractice	3
Asset protection	1		Mandatory reporting: child abuse	3
Billing codes	5		Mandatory reporting: communicable disease	1
Business plan development	10		Marketing	8
Business structure	8		Medico legal reports	4
Communication with other professionals	3		Multidisciplinary practices	3
Communication/public speaking	2		Negligence	3
Complaints process	2		Office layout/size	4
Computer programs	4		Office policy and procedures	6
Confidentiality	3		Office staff/employees	10
Consent/informed consent	6		Other agreements(managed care/diagnostic)	4
Contract: associate agreements	4		Practice promotion	2
Contract: lease	5		Practice management	5
Contract: purchase agreement	4		Privacy	2
Contracts (unspecified)	5		Products (orthotics, supplements)	2
Court and trial procedures	5		Professional associations	3
Defense to claim	2		Quality assurance (continuous education)	2
Demographics (practice location)	5		Recent court decisions/issues	3
Discipline process	3		Record keeping	8
Doctor-patient relationship	4		Referral/ dismissal procedures	7
Equipment/ chattels/ fixtures	5		Scope of practice	4
Estate planning	1		Search warrants/ depositions	2
Ethics and codes of conduct	10		Sexual abuse/boundaries/misconduct	6
Fee schedules/block payment	5		Sexual harassment	3
Financing (banking)	9		Sources of reimbursement (WSIB, HMOs)	2
Fraud enforcement	3		Standards/ statutes	5
Health promotion	2		Taxes	3
Human Rights/Diversity	1		Tort law	2

"Health care providers have an obligation to the patients they serve, and to society, to provide competent and effective care, and to do so in a professional manner. Doctors of chiropractic must exhibit ethical values and behaviors, recognize their responsibility to first serve the patient, and to follow sound business practices. It is important that doctors of chiropractic maintain knowledge and clinical skills through continuing education, and be able to access, understand and critically appraise the research literature"[7p62]

The Federation document then proceeds to delineate a number of attitudes, knowledge and skills that students must demonstrate with respect to *"Professional Issues," "Record Keeping"* and *"Doctor-Patient Relationship."* These include;

- recognize the need that records relevant to patient's care be legible, accurate, complete and current;
- know what elements should be included in the record;
- know what is accepted with respect to record maintenance, storage and security;
- provide abbreviation codes;
- appreciate importance of compassion, empathy and touch;
- legal necessity of informed consent;
- know and employ procedures to reduce potential risk and professional liability;
- exhibit behavior and a communication style that projects a professional image;
- supporting and participating in professional activities and organizations;
- exhibit ethical attitudes regarding provision of patient care;
- refrain from illegal and unethical patient care and practice management procedures (undefined);
- be aware of and comply with professional reporting requirements;
- develop ethical practices with respect to marketing;
- understand need to follow sound business practices involving leases, loans etc

However, the Federation document does not, and probably cannot, provide an exhaustive list of what topics should be included in jurisprudence and business management courses. For example, although the Federation document specifically lists under 'Doctor-Patient Relationship' the student must demonstrate the ability to *'recognize the need to establish and maintain appropriate boundaries in doctor-patient interactions,'*[7p61] it does not specifically mention the prohibition against engaging in sexual relationship with one's patients.

A literature search was conducted of the Index to Chiropractic Literature (ICL) and MEDLINE through PubMed for peer-reviewed articles on the teaching of jurisprudence and/or practice management in an undergraduate setting, published in English. No date limit was used. In both databases the search combined text words (natural language) and controlled vocabulary; ChiroSH (Chiropractic Subject Headings) in ICL and MeSH in PubMed. ICL subject headings included Jurisprudence, Practice Management, Curriculum and Education as a subject keyword. MeSH terms included Practice Management, Jurisprudence/education, Curriculum and Education, Medical, Undergraduate. The search also included text words such as business and marketing, and hand-searching the Journal of Chiropractic Education. This search strategy uncovered very few published studies that discussed chiropractic jurisprudence or business management education, as well as jurisprudence and business management issues from other health care disciplines as well [There are a few published studies that describe a specific college's experience with teaching a particular topic: these are discussed in a companion article].[8] A few authors concluded, based on findings derived from their own chiropractic colleges, that more education is generally required to satisfy the needs of new graduates. For example, a study by Fleetwood and King[2] reported, based on a survey of 70 'experienced' British chiropractors that respondents rated the overall importance of having knowledge of business management matters as being high or very high and that *'more prominence should be given to this skill as part of chiropractic training.'*[2p3] The same search strategy found articles from the medical[3–5] and dental[6] professions that expressed the same concerns.

Based on this search, no previous studies have been published that have conducted a comparative audit of what is taught at different accredited chiropractic colleges, or of colleges that teaches other health care disciplines. Therefore, this study appears to be the first of its kind.

Limitations of the Study

There were several limitations to this study. Chief among them was that the course syllabus submitted to this author may not contain all the information taught in a particular course. The author resisted the temptation to contact each course coordinator at each respective college to seek clarification with respect to this issue, instead only relying on the information extracted from the course outline. The rationale for this decision was that it was posited that, were the author to ask a course coordinator *'I notice that topic X is not included in your course outline- do you not teach it?,'* the course coordinator, not wishing to seem derelict in their duties or responsibilities, may imply that the content was in fact taught, albeit 'tangentially' or 'in passing,' thus not providing any additional illumination with respect to it being taught formally or not. In other words, since a course coordinator may not want to be perceived by an outside observer as providing a non-comprehensive course, there might be pressure for a course coordinator to insinuate a topic is covered to an extent that it is not. College websites were not reviewed to obtain this information from non-respondent colleges since course descriptions posted on such websites tend to describe a course in general terms only.

Alternatively, it is possible that some topics, such as codes of conduct or ethics, doctor-patient boundaries, financing, and issues germane to office staff/employees are deferred to other courses in the program, during electives or during continuing education programs offered at this or that chiropractic college. Similarly, instruction on topics such as record keeping, prohibition against engaging in sexual relationship with patients and scope of practice may be deferred to a student's clinical internship. In fact, the representative of one North American chiropractic college confirmed that that was the case at the college where he teaches, and that much of the jurisprudence and business management content was delivered to students by their clinicians, although he admitted that part of the curriculum is unstructured and the content delivered is highly variable from one clinician to another. Lastly, it is possible that some of the 62 topics are taught together, such as marketing, advertising and practice promotion, or business plan development and business structure.

Conlusion

While most chiropractic colleges provide some education in the areas of jurisprudence and business management, it would appear that there is no consensus opinion or 'model curriculum' on these topics towards which chiropractic programs may align themselves. Moreover, some colleges do not provide any formalized education on these topics in the form of courses specifically devoted to teaching this content. Instead they defer this component of chiropractic education to the unstructured environment of a student's internship or this content may be covered incidentally throughout a chiropractic program. While it is certainly unfeasibility for an America chiropractic college, for example, to instruct students on all the different regulations, standards of practice, policies and guidelines from all 50 states, a cogent argument can be made that the underlying *principles* of those issues germane to chiropractic jurisprudence and business management ought to be taught. Thus, it might therefore be prudent for chiropractic educators to develop a standardized curriculum on these topics in order to strengthen chiropractic's cultural authority, similar to the process that developed a 'model curriculum' for chiropractic geriatric education that began in the late 1990s[9] and was recently revised.[10]

It is certain imperative that chiropractic educational programs meet the mandate of protecting the public interest while providing graduates with the necessary tools they need to operate a successful chiropractic practice. The data gathered from this study could begin the process of developing a model curriculum for jurisprudence and business management content for chiropractic students in order to meet these important goals. However, a more expansive study must be conducted in order to better assess what is currently being taught, what ought to be taught and where it should be taught (undergraduate courses, clinical internship or continuing educational programs) at accredited chiropractic colleges with respect to jurisprudence and business management.

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Restructuring of the jurisprudence course taught at the Canadian Memorial Chiropractic College

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Introduction*: The process by which the jurisprudence course was restructured at the Canadian Memorial Chiropractic College is chronicled.*

Method: *A Delphi process used to restructure the course is described, and the results of a student satisfaction survey are presented.*

Results: *When asked* "I think this material was clinically relevant," *over 81% of the 76 students who respondents strongly agreed or agreed with this statement; 100% of students agreed or strongly agreed that scope of practice; marketing, advertising and internal office promotion; record keeping; fee schedules; malpractice issues and; professional malpractice issues and negligence was clinically relevant.*
When asked "I think this material was taught well," *a minimum of 89% of students agreed or strongly agreed with this statement.*

Discussion: *This is the first article published that described the process by which a jurisprudence course was developed and assessed by student survey.*

Summary: *Based on a survey of student perceptions, restructuring of the jurisprudence course was successful in providing students with clinically relevant information in an appropriate manner. This course may serve as an important first step in development a 'model curriculum' for chiropractic practice and the law courses in terms of content, format and assessment strategies.*
(JCCA 2010; 54(1):60–68)

KEY WORDS: CMCC, jurisprudence, student, chiropractic.

Introduction : *explication du processus de restructuration du cours de jurisprudence au Canadian Memorial Chiropractic College.*

Méthode : *description du processus delphique de restructuration du cours, et présentation des résultats d'un sondage menée auprès des étudiants.*

Résultats : *Lorsqu'on leur a soumis l'énoncé « Je pense que le matériel est cliniquement pertinent », plus de 81 % des 76 étudiants ont répondu qu'ils étaient d'accord ou fortement d'accord avec cet énoncé ; 100 % des étudiants ont affirmé être d'accord ou fortement d'accord que les sujets suivants étaient cliniquement pertinents : champ d'exercice ; marketing, publicité et promotion interne ; tenue de registres ; liste d'honoraires ; incurie professionnelle ; négligence professionnelle.*
Lorsqu'on leur a soumis l'énoncé « Je pense que la matière est bien enseignée », au moins 89 % des étudiants ont répondu être d'accord ou fortement d'accord avec cet énoncé.

Discussion : *c'est le premier article publié qui décrit le processus d'élaboration d'un cours de jurisprudence et l'évaluation qu'en ont fait les étudiants.*

Sommaire : *selon un sondage sur la perception des étudiants, la restructuration d'un cours de jurisprudence a permis de fournir de manière adéquate des renseignements cliniquement pertinents aux étudiants. Ce cours constitue une première étape importante dans le développement du contenu, du format et des stratégies d'évaluation d'un « programme d'études modèle » pour les cours de droit relatifs à la chiropratique.*
(JCCA 2010; 54(1):60–68)

MOTS CLÉS : CMCC, jurisprudence, étudiant, chiropratique.

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"I will refrain from any act of wrongdoing and will regard the keeping of a patient's confidentiality as a moral obligation, using any such information only in his or her best interests."

Excerpt from the *'Chiropractic Oath'*[1] sworn to by graduates of the Canadian Memorial Chiropractic College during Convocation.

Introduction

As many of the readers of this journal will undoubtedly know – since many of them are graduates of the Canadian Memorial Chiropractic College (CMCC) – the course that taught chiropractic students jurisprudence and business management was coordinated and principally delivered by Allan M. Freedman, B.A., LLB, a long-time veteran of CMCC whose contributions to the chiropractic profession were recently chronicled by Dr Douglas M. Brown in the JCCA.[2] Mr. Freedman taught this content for over 30 years, starting in the mid-1970s, until he resigned from the faculty in 2008 (he continues to provide legal advice to CMCC). His departure provided an opportunity to review the content of that course and decide whether or not a restructuring of the course was appropriate.

Contemporaneously, a fourth year business management course (taught during the student's clinical internship) was likewise under review. Developed in the mid-2000s this course had several iterations and passed through several different hands, and has now developed a degree of permanence with respect to its content and instructors. With that course now more firmly entrenched in fourth year, and strictly focusing as it does on issues relating to business management, there was an opportunity to restructure the jurisprudence course (delivered in third year) in concert with the business management course. In other words, with the resignation of Allan Freedman an opportunity presented itself whereby the course that delivered issues germane to chiropractic jurisprudence could be coordinated with the business management course in such a way as to avoid unnecessary redundancies but simultaneously segueing and providing a relatively seamless transition from one course to the next.

The purpose of this article is to describe the process by which the restructuring of the jurisprudence course at CMCC took place. As an indication of whether or not the restructuring of the course was progressive or regressive in nature, the results of a student assessment survey are presented. The survey sought to determine (i) students' perception of the clinical relevance of the material (topics) delivered, (ii) whether or not the course material was delivered well; (iii) comments about the course in general (organization, fairness of assessment and so on) and (iv) general comments about the course instructors.

Method

This study was approved by the ERB at CMCC.

Course Content Development: Delphi Process

Essentially, a Delphi process was initiated to gather more information as to what deficiencies, if any, the jurisprudence course may have had in its previous incarnation. A panel was convened comprised of the Dean of the Undergraduate program, chair of the department in which this course is situated (Chiropractic Practice and Principles), the faculty person who principally instructs CMCC students on 'ethics,' two senior (fourth year) class representatives, two outside chiropractic content-experts (representatives of two provincial licensing boards) and this author. This group met on three different occasions during the winter of 2007–08. Each member of the group expressed what they perceived were strengths and weaknesses of the jurisprudence course, what was worth preserving and what needed to be changed, as well as the strengths and weaknesses of the fourth year business management course. Lastly, the group provided a road map of what specific content ought to be added, preserved or deferred from the jurisprudence course to the business management course. A series of action steps were developed, with appropriate timeline and deliverables; this included scheduling submissions to the requisite internal committees to obtain approval of any proposed course changes.

Course Content Development

Armed with the general information from the Delphi process, a job posting was placed to hire a new course coordinator for the jurisprudence course, now called 'Chiropractic Practice and the Law' (CPL). The successful candidates were this author and a co-applicant, Joel Friedman B.Sc., LLB (no relationship to Allan Freedman), a lawyer and the Director, Policy and Research, at the College of Chiropractors of Ontario (CCO), the regulatory body of chiropractors in Ontario.

Friedman and this author reviewed the course syllabus from Mr. Freedman and, based on the input from the Delphi group, decided to defer the following content to the business management course:

- banking; insurance (life, disability, office content and so on);
- taxes (including issues related to practice incorporation);
- office policies and procedures (including staff hiring and other human resource issues);
- 'types of practice' options (solo practitioners, associateships, multi-disciplinary clinics, for example) and;
- 'employment opportunities available to chiropractors' (private practitioner, researcher, teaching faculty, third party assessor etc.).

In place of this content, the course coordinators posited that the jurisprudence course ought to provide more robust and specific information on a number of issues germane to jurisprudence and the law, from a national or federal perspective. The content areas that were to be covered in depth included:

- law (administrative, criminal, tort, civil);
- privacy and confidentiality;
- current legal issues related to chiropractic (inquests, class actions suits);
- capacity legislation;
- consent legislation;
- use of personal health information;
- 'who's who' (description of the various chiropractic organizations in Canada and abroad, along with their respective mandates);
- 'what's what' (differentiation between case law, regulations, standards of practice, guidelines, policies and by-laws);
- codes of conduct and ethics [this included the 33 *Health Professional Procedural Codes* of Ontario,[3] codes of conduct from various provinces and the codes of conduct developed by the Canadian Chiropractic Association[4]];
- scope of practice;
- marketing, advertising and internal office promotion;
- independent chiropractic examinations;
- fee schedules;
- quality assurance initiatives (practice/peer assessments, continuous education requirements, self-assessment protocols);
- record keeping;
- contracts;
- prohibition against sexual relationship with patients;
- standards of practice unique to each province and;
- the complaints and discipline processes.

Table 1 *Components of the Assessment Strategy for the Chiropractic Practice and the Law/Jurisprudence course*

• Submission of medical-legal report • Attendance at Disciplinary Hearing (any regulated health provider) • In-class, open book quizzes • Multiple-choice, short answer and essay examinations • Jeopardy-style review • Development of Business Plan (submitted for grading to the Business Management course)

The reorganization of the course content from the jurisprudence course to the business management course resulted in a reduction of hours of the CPL course from 52 to 28 hours.

To achieve the goal of providing as much as information from a national or federal perspective as possible, the course coordinator (the author) emailed representatives from provinces across Canada and requested they send him a copy of their respective provincial codes of conduct, regulations, standards of practice and so on. Eight provinces (British Columbia, Alberta, Saskatchewan, Ontario, Nova Scotia, New Brunswick, Newfoundland and PEI) responded to this request.

It must be emphasized that many of the innovations Allan Freeman introduced to the jurisprudence course were preserved (Table 1). For example, a few years ago, Freedman required students to attend a discipline hearing at any regulatory body, perhaps in hopes of demonstrating the unpleasantness of the process and strengthening the resolve of students to avoid being caught in that process themselves. [In point of fact, this process is unpleasant for all involved parties, as discussed in an editorial entitled *"The Burden of Discipline"* (in press) written by this au-

thor]. Another innovation of the course held over from Freedman was the requirement of all students to submit for grading a 'medical-legal report.'

Additionally, and more importantly, several years ago, Freedman required students to submit a business plan for his review and grading. Students were required to create a business plan proposal, similar to a plan they would have to develop for themselves upon graduation. This plan is often in the form of a proposal to a lending institution (bank) in hopes of securing the necessary finances to fund a chiropractic practice (see Table 1). Currently, this 'Business Plan' assignment, while introduced in the CPL course, is now the primary means of assessment for the fourth year business management course.

The repositioning of the business plan assignment from the CPL course to the business management course necessitated changes be made to the CPL course assessment strategy. Specifically, assessment for the CPL course now consisted of four in-class, scheduled, open-book quizzes, two tests (consisting of multiple choice, short answer and essay questions), the medical-legal report and the discipline hearing report. A unique innovation brought to the CPL by this author was the development of a 'Jeopardy-style' game for the students to participate in during the last class of the course in order to review all course work. For 'Jurisopardy' all the students are randomly divided into three color-coded groups. Questions are created beforehand and formatted onto a 1997-PowerPoint program with two step animation; one step to reveal the question, the other step reveals the answer once one of the students (representing their team) answers the question correctly. Just like the televised game show, our version of Jeopardy contains 'daily doubles' and 'final jeopardy.' Points are accrued until the completion of the game, and the winning group of students is awarded an appropriate prize; in this case, a box of Timbits (!).

(Author's note: To assist field doctors in their business endeavors still further, CMCC is currently undertaking the development of an eCommerce course via its Continuing Education Division. This eCommerce program is being piloted for review for the summer of 2009 and should be commercially available by the fall).

In order to determine if the inaugural year of the CPL course was a successful, and to identity any areas of strengths and weaknesses of the course, an on-line anonymous survey was designed.

Table 2 *Items to be included in the 'Business Plan' submitted by students for assessment*

- a description of where the proposed office is to be located;
- demographic information of that area;
- the type of practice to be conducted;
- services provided;
- office policies and procedures;
- layout of the office;
- equipment and chattels;
- fee schedules;
- projected profit/loss balance sheets;
- insurances required; a lease or agreement to purchase;
- associateship agreements (if applicable);
- sublet agreements (if applicable);
- advertising costs (including phone cost, yellow page advertisements, websites);
- leasehold renovations, including permits and costs, if required;
- radiographic equipment (along with proof of adherence to relevant legislation governing use of x-rays);
- personal expenses (rent, student loan repayment, food, transportation, entertainment costs) and;
- other costs incurred while operating a chiropractic clinic.

Student Survey

Using a program called Survey Monkey, an internal anonymous student survey was developed that sought to assess students' attitudes and opinions on a number of issues presented in this course. Unlike many similar surveys, since the course material provided was novel and had not been taught previously in this manner, the survey was divided into the following question headings: (i) student's perception of the clinical relevance to chiropractic practice of each topic taught; (ii) 'how well' the course was delivered; (iii) what students liked about the course; (iv) what could be done to improve the course; (v) their attendance and (vi) general opinions of the teaching skills of the course instructors.

For the survey, a 6-point rating scale was used. For this survey, students were given the following response

options: 0 (No Opinion); 1 (Strongly Disagree); 2 (Disagree), 3 (Neutral); 4 (Agree) and 5 (Strongly Disagree). Students were instructed to log into the college's email system and were able to anonymously participate in the survey, using a unique identifier (each student could only complete one survey). Upon completion, the survey was electronically filed within the college's data base. It must be emphasized that students were asked to complete this survey upon the completion of the course, after all the assignments and examinations were graded and those grades were submitted to the Dean's Office: This would allow students to provide whatever comments they chose to provide without fear of retribution from the course instructors. Students were also informed that the results obtained from this survey may be used for research purposes, and approval was obtained from the ERB of CMCC to do so.

For ease of discussion in this article, the 6 survey options were collapsed into the following 4 groups: No opinion; Strongly Disagree/Disagree; Neutral; Agree/Strongly Agree. Seventy-six (76) students completed the survey, out of 179 third year students.

Results of Student Survey

Students' Opinion of Clinical Relevance of Course Material Delivered.

When asked, the vast majority of students reported they either agreed or strongly agreed with the statement that every topic delivered during the CPL course was 'clinically relevant' (see Table 3). Only three subject topics of the 25 topics delivered – *Overview of tort law,* the *Canadian Legal System* and *Other Standards Across Canada* – scored below 85% with respect to this question. Conversely, 100% of students agreed or strongly agreed with the statement that the following topics were clinically relevant: scope of practice; marketing, advertising and internal office promotion; record keeping; fee schedules; malpractice issues (delivered by representatives of the CCPA) and; professional malpractice issues and negligence. The other topics presented in the course were perceived by students to generally be clinically relevant (see Table 3).

Students' Opinion with respect to 'how well' content was delivered

When asked, respondents reported that only two subjects – *Introduction to the Canadian Legal System* and *'Contracts'* – scored less than 92% with respect to this question (Table 4). Conversely, students who responded to this survey overwhelming reported they perceived each topic was well delivered.

As further evidence of this sentiment, a representative sample of student comments are provided in Table 5. Overall, there were 43 positive comments provided by the 76 students who responded to the survey when asked *"what did you like about the course?"* When asked, *'what could be done to improve the course?'* 32 students provided comments, although half of these comments were *'nothing'* or *'it's good.'* The only consistently negative comments reported from some students was their perception that one of the lecturers occasionally spoke too fast during lectures, one lecturer was less animated than the other and a few students did not like that the course was often scheduled to start at 8am.

Discussion

A literature search was conducted and revealed a general paucity of references pertaining to the topic of (i) chiropractic jurisprudence and (ii) business management courses. A search was conducted of the Index to Chiropractic Literature (ICL) and MEDLINE through PubMed for peer-reviewed articles on the teaching of jurisprudence and/or practice management in an undergraduate setting, published in English. No date limit was set. In both databases the search strategy used a combination of text words (natural language) and controlled vocabulary; [ChiroSH (Chiropractic Subject Headings) in ICL and MeSH in PubMed]. ICL subject headings included Jurisprudence, Practice Management, Curriculum and Education as a subject keyword. MeSH terms included Practice Management, Jurisprudence/education, Curriculum and Education, Medical, Undergraduate. The search also included text words such as business and marketing, and hand-searching of the Journal of Chiropractic Education.

This search strategy yielded 26 articles on the topic of chiropractic jurisprudence and 45 articles on the topic of business management course. Those studies that were retrievable generally provided broad and otherwise nonspecific information pertaining to the importance of educating students with respect to issues germane to jurisprudence and business management.

For example, with respect to articles pertaining to chiropractic jurisprudence, 12 of the 26 citations were 'letters

Table 3 *Student response to the question:* "I think this material was clinically relevant" *(n = 76)*

Topic	Strongly Agree	Neutral	Strongly Disagree	No Opinion
Introduction (who's who, what's what)	86.4%	9.1%		4.5%
Canadian Legal System	84.9%	12.1%	3%	
Overview of Self-Regulation	97%	3%		
Codes of Conduct and Ethics	97%	1.5%		1.5%
Scope of Practice	100%			
ICEs	91.9%	9.1%		
Fee Schedules	100%			
Marketing, Advertising and Internal Office Promotion	100%			
Quality Assurance	95.5%	3%	1.5%	
Peer Review	92.4%	7.6%		
Continuous Education	94%	4.5%	1.5%	
Record Keeping	100%			
Prohibition Against Sex with Patients	98.5%	1.5%		
Other Standards Across Canada	81.3%	16.7%	3%	
Complaints Process	95.5%	4.5%		
Discipline Process	97%	1.5%	1.5%	
Malpractice Issues (CCPA)*	100%			
Professional Malpractice and Negligence	100%			
Consent Legislation	97%	3%		
Privacy Law (PHIPA)	95.5%	4.5%		
Capacity Law	92.4%	7.6%		
Use of Personal Health Information	97%	3%		
Current Legal Issues in Chiropractic**	97%	3%		
Contracts	97%	3%		
Overview of Tort Law	84.9%	4.5%	10.6%	

* Examples include Scope of Practice Review in Ontario by DCs and PTs, Class Action Suit in Alberta, Inquests.
** Taught by representatives of Canadian Chiropractic Protective Association.

to the editor' and 'letters to the editor in reply' pertaining to an article written by this author describing the demographic trends of technique systems in chiropractic and their impact on issues of jurisprudence in Canada.[5] In that article, Gleberzon wrote about *'chiropractic technique'* (how they can be defined), *'standards of care and guidelines,*' '*self-regulation,*' '*informed consent*' and '*guiding professional practice standards of care'* (using as an example the previous prohibition against the use of instrumented adjustive techniques in Saskatchewan).[5]

Table 4 *Student response to the question:* "I think this material was well delivered" *(n = 76)*

Topic	Strongly Agree	Neutral	Strongly Disagree	No Opinion
Introduction (who's who, what's what)	91.9%	6.1%	3%	
Canadian Legal System	81.9%	13.6%	4.5%	
Overview of Self-Regulation	92.5%	4.5%	3%	
Codes of Conduct and Ethics	97%	1.5%	1.5%	
Scope of Practice	98.5%	1.5%		
ICEs	97%	1.5%	1.5%	
Fee Schedules	96.5%	3%	1.5%	
Marketing, Advertising and Internal Office Promotion	97%	3%		
Quality Assurance	98.5%	1.5%		
Peer Review	94%	4.5%		1.5%
Continuous Education	95.5%	1.5%	1.5%	1.5%
Record Keeping	98.5%	1.5%		
Prohibition Against Sex with Patients	100%			
Other Standards Across Canada	98.5%	1.5%		
Complaints Process	98.5%	1.5%		
Discipline Process	100%			
Malpractice Issues (CCPA)	100%			
Professional Malpractice and Negligence	98.5%	1.5%		
Consent Legislation	98.5%	1.5%		
Privacy Law (PHIPA)	98.5%	1.5%		
Capacity Law	98.5%	1.5%		
Use of Personal Health Information	100%			
Current Legal Issues in Chiropractic	98.5%	1.5%		
Contacts	89.4%	1.5%	9.1%	
Overview of Tort Law	98.5%	1.5%		

An article by Henson *et al* provided the results obtained from 64 chiropractors who were surveyed with respect to their perception of the need of business skill education for chiropractors.[6] The respondents indicated the need was either 'high' or 'very high' for chiropractors to learn about the following business activities: organizational behavior and human resources; strategic management; finance; marketing; law and ethics; accounting; managerial decision making and; operational and systems management.

The same respondents perceived that the existing level

Table 5 *Sample of student comments about the "Chiropractic Practice and the Law" course at CMCC (2009)*

"Every aspect of this course was fantastic. The quizzes, the assignments, the examination, the lectures by both instructors – all aspects of this course were very well conducted"

"Essential to any chiropractor. This course taught me a lot about how the CCO works and what it does and what is 'expected' in Chiropractic practice when it comes to patient management and the Law. Instructors did a very good job of putting material together."

"I enjoyed the instructor's stories that he included in the lectures. Scope of practice, fees, advertisement, etc ... all the things surrounding actually practicing and running a practice."

" – well organized – made to be engaging and interesting as it could be – Jeopardy Review at the end was fantastic – open book quizzes promoted attendance without Adding stress to an already stressful time, and still promoted learning by allowing Us to see the types of questions that would be on the exams, plus emphasizing the Important points of lectures – both instructors were highly passionate about their Material, attempted to connect with the students etc."

"it was real! It was relevant! It was practical and useful! It was extremely well presented by the two main lecturers. Quizzes were fair and a good way to ensure we stayed on top of the course material ... also allowing us to split up the marks off of a 100% exams. The fact that the quizzes were announced ahead of time helped as well."

"The content of this course is important to anyone who is going into practice. every person who graduates from CMCC needs to be aware of the Code of conduct, Malpractice Issues, Consent, etc. I also liked that the instructor was organized throughout the course ... Instructor made the material clinically relevant ... This is one of the best courses in the 3rd year program."

"All material covered in this course is relevant to our practice as future chiropractors."

"course was very informative touching on key basics that will aide in me in my Chiropractic future. Examples used in class were insightful and applicable. It was to the point and wasn't designed to trick/mess with student's heads during the examination process. This is an area we don't want to have people confused about."

of knowledge among chiropractors was low with respect to the aforementioned topics (ranging from 3% to only 19%). Lastly, the researchers reported that there was a significant 'gap' between what was needed to know and was known (existing knowledge) with respect to: accounting (72% gap); finance (70% gap); strategic management (68% gap); organizational behavior and human resources (67% gap); marketing (66% gap); managerial decision making (60% gap); law and ethics (56%) and operations and systems management (47% gap). These findings led the authors to conclude:

> *"The chiropractic profession needs significant greater business and practice management skills. The existing gap between needed business skills and existing skills suggests that current training and education programs are not providing adequate business skill training" (6p145)*

Good[7] explained the methods he employed at New York Chiropractic College to teach students ethics and professionalism, using a set of provocative items derived from the media. He also stated he redesigned the assessments

to be more rigorous. Good described this effective strategy as a teaching method with *'a little bit of attitude.'*[7p14] Lund and Pryor reported the results of a survey of clinics at the Life University with respect to ethical behavior, awareness of technology and its applications, and role modeling.[8]

Donaldson and Lewis[9] described a process whereby they identified the barriers and potential benefits of converting paper records to digital records at Life Chiropractic College West. Cambron and Langworthy[10] surveyed students with respect to their informed consent practices. In general, these researchers reported that the majority of graduating students from the National University of Health Sciences were informing their patients about *'the therapeutic processes as well as the associated risks and* benefits'[10p41] but the majority of students did not cover the area of consent regarding diagnostic processes.

McAulay and Newlin provided the results of a second survey conducted at Life University that sought to determine what variables were necessary for a successful practice.[11] These authors advanced on the results from a survey published a few years earlier that reported service (practice volume), not income, is what drives a successful practice.[12] In this study, McAulay and Newlin presented 12 hypotheses of the relationship of outcome variables (income, patient volume, patient retention and low job stress) and antecedent variables (sincerity of practitioner, ability to capably educate patients, having an effective fee system and so on).[11]

Summary

Based on a survey of student perceptions, the course content of the Chiropractic Practice and the Law course at CMCC, restructured (while incorporating key elements) from the previous jurisprudence course, was successful in providing students with clinically relevant information in an appropriate manner. Future surveys will continue to monitor student satisfaction with the course content and its delivery. Since the format of this course was met with such a high level of student satisfaction, and bearing in mind the lack of consistency with respect to the course content of jurisprudence and business management courses taught at accredited chiropractic colleges throughout the profession,[13] this course may serve as an important first step in developing a 'model curriculum' for chiropractic practice and the law courses in terms of content, format and assessment strategies.

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