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# Degree of Vertical Integration Between the Undergraduate Program and Clinical Internship with Respect to Lumbopelvic Diagnostic and Therapeutic Procedures Taught at the Canadian Memorial Chiropractic College

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**Purpose:** The objective of this study was to determine to what extent the diagnostic and therapeutic procedures taught in the undergraduate program used for patients with lumbopelvic conditions are expected to be utilized by students during their clinical internship program at Canadian Memorial Chiropractic College or are being used by the clinical faculty. **Methods:** A confidential survey was distributed to clinical faculty at the college. It consisted of a list of diagnostic and therapeutic procedures used for lumbopelvic conditions taught at that college. Clinicians were asked to indicate the frequency with which they performed or they required students to perform each item. **Results:** Seventeen of 23 clinicians responded. The following procedures were most likely required to be performed by clinicians: posture; ranges of motion; lower limb sensory, motor, and reflex testing; and core orthopedic tests. The following were less likely to be required to be performed: Waddell testing, Schober's test, Gillet tests, and abdominal palpation. Students were expected to perform (or clinicians performed) most of the mobilization (in particular, iliocostal, iliotransverse, and iliofemoral) and spinal manipulative therapies (in particular, the procedures referred to as the lumbar roll, lumbar pull/hook, and upper sacroiliac) taught at the college. **Conclusion:** This study suggests that there was considerable, but not complete, vertical integration between the undergraduate and clinical education program at this college. (*J Chiropr Educ* 2010;24(1):46-56)

**Key Indexing Terms:** Chiropractic; Education; Lumbosacral Region

## INTRODUCTION

The development of any product or service necessitates the careful and systematic monitoring of its suitability for the purpose for which it was designed. In a process often referred to as quality assurance (QA), this is a system of procedures, checks, audits and, if required, corrective actions used to ensure that all research, testing, monitoring, sampling, analysis, and other technical and reporting activities are of the highest achievable quality.<sup>1</sup> This process should not only be applied to tangible and commercial products (cars, furniture, homes), but it is imperative it be applied to intangible products

such as educational programs that train students to be competent to provide a product (ie, health care) to a consumer (ie, patients). In other words, one of the primary purposes of QA is to serve to benefit the quality of care provided.<sup>1</sup>

The development of the components of an educational program in a professional discipline such as chiropractic rests on several assumptions. First among these is that those procedures taught to students during their undergraduate training ought to reflect, as much as possible, the practice activities of an average field practitioner. The successful bridging between the two relies on the skills of supervising clinicians during a student's internship. In other words, there ought to be a reasonably smooth transition from a student's undergraduate training through their clinical internship and ultimately into their professional practice activities. This smooth transition from student to intern to practitioner requires

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careful monitoring, in the form of quality assurance of the degree of curricular vertical integration.

It is generally agreed that there is considerable variability with respect to practice activities among different practitioners. This variability is understandable given the differences in the level of clinical experience, personal preference, research activities, the individual's anthropomorphic features (age, weight, height, sex), and educational experience (eg, perhaps preference toward a mentor's clinical approach). However, it is much less expected (or desired) that this same degree of variability exists within the various upward steps of a curriculum of the same educational or vocational program and such programs ought to exhibit a high degree of vertical integration. A quality assurance program can help ensure that this is indeed taking place.

Another factor necessitating the implementation of a QA program in education is time or, more specifically, the limits of time. Time is a precious commodity in any academic institution when it comes to scheduling and program delivery, because time impacts costs of the delivery of a program (which ultimately drives tuition costs) and a perceived "wasting of time" by consumers (in this case, students) could be expressed as dissatisfaction for an educational program. Specifically, in the case of this study, if it is discovered that a great deal of time is allocated to the teaching and instructing of procedures during the undergraduate program that are not being used in a student's internship, then this discrepancy should be brought to the attention of course coordinators and curriculum planners who can then better allocate time spent on various procedures.

In the field of chiropractic, students must be competent to perform a number of diagnostic and therapeutic procedures, ranging from history taking, physical examination testing, and care management delivery. These doctor-patient skill sets include a variety of psychomotor skills ranging from assessment procedures [postural analysis, palpation (static and motion), joint play, orthopedic/neurological tests] to therapeutic maneuvers (soft tissue therapies, mobilizations, and manipulative procedures of the spine and peripheral joints). At this college, interns provide patient care under the direct supervision of their clinicians. In essence, interns are practicing under their clinician's license. Thus, interns are only able to perform those diagnostic tests and therapeutic procedures specifically agreed to by the supervising clinician. If they conduct a test or provide a service

without their clinicians' approval, the interns are disciplined.

The objective of this study was to determine to what extent the diagnostic and therapeutic procedures taught in the undergraduate program at the Canadian Memorial Chiropractic College are expected to be utilized by students during their clinical internship program and/or are being used by clinical faculty themselves. Although the undergraduate program instructs students how to examine the entire body, this study only focused on those procedures specific to the lumbopelvic region.

## METHODS

The study was approved by the Research and Ethics Board at Canadian Memorial Chiropractic College.

### Survey Item Section: Part A

Course syllabi and manuals in the applied chiropractic (technique) and clinical diagnosis departments were used to compile a list of items taught at the college in those undergraduate courses that instruct students in the diagnosis and treatment of low back and pelvic conditions. These items form the basis for responses in Tables 1–4. Diagnostic procedures included in the survey were 1) posture, 2) palpation, 3) orthopedic tests, 4) neurological tests, and 5) tests specific to the abdomen. It should be emphasized that many of these tests, such as postural analysis, static and motion palpation, joint play, Waddell's tests for pain of a nonorganic origin, and aortic auscultation and palpation, are taught in the undergraduate program as being "core" tests to be performed on all new patients. Therapeutic tests included on the survey were 1) manual mobilizations (low-amplitude, low-velocity repetitive motions) and 2) manipulative/adjustive (high-velocity, low-amplitude, thrusting motions) techniques; soft tissue techniques were not included because of the vast number of different styles used among teaching faculty [eg, myofascial/trigger point therapy/ischemic compression, Active Release Therapy, and instrumented soft tissue therapy (ie, Graston)]. Use of modalities (ie, ultrasound, laser, interferential current), exercise, or rehabilitation strategies were not specifically included in this survey, although there was space provided for respondents

**Table 1. Demographic characteristics of respondent clinicians**

Characteristic and Specific Feature	No. of Respondents ( <i>n</i> = 17)
General information	
Sex	14 male/ 3 female
CMCC graduate	17
Familiar with CMCC diagnostic and therapeutic procedures	17
Years in private practice (<10 years)	4
Years as college clinician (<10 years)	6
Private practice characteristics	
Solo practitioner	4
Partnership	0
Associateship	4
Solo and associateship	5
Locum	1
Other	2
Private practice focus (area of specialization)	
General practice	13
Sports medicine	5
Pediatric	2
Multidisciplinary	4
Other	1
Technique system(s) and other therapies used in private practice	
Activator	3
Diversified	17
Motion palpation	1
Applied kinesiology	0
Gonstead	1
Thompson Terminal Point	1
Craniosacral	1
Hole-in-one	0
Massage therapy	6
Active Release Therapy	2
Logan Basic	1
Acupuncture	3
Other	8
Special interest area included in practice	
Nutritional counseling	5
Orthotics	11
Auxiliary therapies (modalities)	8
Rehab and exercises	17
Other	2 (Independent chiropractic examinations)

CMCC = Canadian Memorial Chiropractic College.

to include that information if they so chose. Also not included in this survey were home care recommendations (ice/heat, bed rest), nutritional supplementation, or other healthful lifestyle modifications that are often suggested by practitioners for patients with lumbopelvic conditions.

### Survey Item Selection: Part B

The second part of the survey gathered general information about the clinicians and their private

practice characteristics, such as practice style, techniques used, number of years in practice, and so on.

### Pretest

Once developed, the survey was given to a convenient sample of nonclinician faculty at CMCC to ensure ease of completion and clarity of instructions. Six technique tutors were asked to complete the survey. Their feedback was incorporated into subsequent versions of the survey. The data collected from

**Table 2. Use in private practice and/or requirement by clinicians for interns to perform “general procedure” assessments taught in undergraduate program**

General Procedures	Rarely/Seldom (%)	Occasionally (%)	Frequently/Very Frequently (%)
Posture			
Anterior	11.8	5.9	82.4
Posterior	11.8	5.9	82.4
Lateral	11.8	5.9	82.4
Gait			
Normal		17.6	82.4
Heel	5.9	5.9	88.2
Toe	5.9	5.9	88.2
Tandem	11.8	35.3	52.9
Range of motion			
Active			100.0
Passive	5.9	5.9	88.2
Resisted		5.9	94.1
Waddell's tests			
Simulation test	23.5	47.1	29.4
Distraction test	23.5	35.3	41.2
Overreaction sign	23.5	47.1	29.4
Superficial tenderness	17.6	35.3	47.1
Cogwheeling	47.1	41.2	11.8
Reflexes			
Plantar			100.0
Achilles			100.0
Patellar			100.0
Triceps		29.4	70.6
Biceps		29.4	70.6
Brachioradialis		29.4	70.6
Leg length			
True	52.9	47.1	
Apparent	52.9	41.2	5.9
Joint play			
Broad PA	6.3	6.3	87.5
Segmental PA	6.3		93.8
Lateral spinous challenge			100.0
Flexion	23.5	35.3	41.2
Extension	5.9	41.2	52.9
Lateral flexion	5.9	23.5	70.6
Rotation	6.3	18.8	75.0
Motion palpation			
Gillet test I	70.6	17.6	11.8
Gillet test II	70.6	17.6	11.8
Gillet test III	70.6	17.6	11.8
Gillet test IV A	64.7	17.6	17.6
Gillet test IV B	64.7	23.5	11.8
Gillet test V	70.6	17.6	11.8
Other			
Sensory testing			100.0
Motor testing			100.0
Muscle girth	5.9	58.8	35.3
Soft tissue palpation			100.0
Spinous percussion	11.8	64.7	23.5

PA = posterior-anterior.

**Table 3. Use in private practice and/or requirement by clinicians for interns to perform orthopedic tests as taught in undergraduate program**

Orthopedic Tests	Rarely/Seldom (%)	Occasionally (%)	Frequently/Very Frequently (%)
Kemp's			100.0
Schober's test	50.0	50.0	
Trendelenburg		35.3	64.7
Valsalva	5.9	11.8	82.4
Minor's sign	18.8	31.3	50.0
Pedal pulse	47.1	47.1	5.9
SLR			100.0
Crossed SLR		5.9	94.1
Braggard's		11.8	88.2
Bowstring's		17.6	82.4
Gaenslen's		5.9	94.1
Thomas		11.8	88.2
Herron-Pheasant's	23.5	47.1	29.4
Sciatic notch tenderness		11.8	88.2
Spinous tenderness		5.9	94.1
SI compression			100.0
Side-lying SI compression	5.9	41.2	52.9
Open book	17.6	23.5	58.8
Patrick Fabere's			100.0
Yeoman's			100.0
Psoas palpation	11.8	11.8	76.5

SLR = straight leg raise, SI = sacroiliac.

**Table 4. Use in private practice and/or requirement by clinicians for interns to perform abdominal examination procedures taught in undergraduate program**

Abdominal Examination	Rarely/Seldom (%)	Occasionally (%)	Frequently/Very Frequently (%)
Abdominal inspection	41.2	29.4	29.4
Abdominal auscultation	47.1	35.3	17.6
Abdominal percussion	47.1	47.1	5.9
Light abdominal palpation	41.2	41.2	17.6
Deep abdominal palpation	47.1	35.3	17.6
Liver palpation	76.5	23.5	
Spleen palpation	76.5	23.5	
Kidney palpation	62.5	37.5	
Kidney punch test	29.4	29.4	41.2
Hernia palpation	64.7	29.4	5.9
Murphy's sign	47.1	47.1	5.9

the technique tutors were destroyed and not included in this study's results.

### Target Respondents' Eligibility

The survey was circulated to all clinical faculty at the college. Clinicians were asked to indicate the

frequency with which either their interns or they themselves utilize each of the listed items in their respective teaching clinics.

### Survey Completion Instructions

Using a 5-point rating scale ("rarely", "seldom", "occasionally", "frequently", "very frequently"),

clinicians were instructed to indicate which one of the following options they either 1) use themselves in private practice and/or 2) require their interns to perform with respect to each item on the survey. While we could have only instructed clinicians to restrict their responses to the frequency in which they require *interns* to perform all the items on the survey, we posited that there would be a high correlation between those items that a clinician requires a student to perform and those items that the *clinician* performs on his or her own patients. In other words, we theorized it would be very unlikely that a clinician would require students to perform a diagnostic or therapeutic test on their patients that they themselves did not perform in their private practices.

### Confidentiality

Clinicians were not required to identify themselves in any way and they had the option to return the survey in an unmarked envelop to any of the investigators.

### Data Analysis

The Excel (Microsoft Inc, Redmond, WA) add-in “xldataanalyst” was downloaded from the website <http://www.xldataanalyst.com/Basic/index.htm> and used to calculate a variety of common statistics. The data were coded from the survey results and input into Excel such that rarely and seldom = 1, occasionally = 2, and frequently and very frequently = 3. We then had the program calculate the percentages with which these options were selected. The data were converted into tables. For the second part of the study, the data were coded such that the clinician’s years of experience category was a 1 if it was less than 10 years and 2 if it was more than 10 years. These data were run through Crosstabs and also compared two averages (their years of experience versus their response on each technique question).

### Deception

No deception was used in this study.

## RESULTS

### Response Rate

All 23 clinicians at the college were surveyed; 17 responded, yielding a response rate of 73.9%. All returned surveys were completed sufficiently to be used in the data analysis. All surveys were completed sufficiently for their data to be analyzed for part A of this study; however, one clinician did not indicate how many years of experience he or she had; this data set was not included in part B of this study. Subsequently, part B of this study is based on the data from 16 respondents only.

### Demographic Data

Of the 17 respondents, 14 were men and 3 women; all were graduates of the college and reported to be familiar with techniques and procedures taught in the undergraduate program. When asked how many years they had been in practice, 4 had been in private practice for less than 10 years and 12 had been in practice for more than 10 years. Six respondents had been clinical faculty at the college for less than 10 years and 10 had been clinical faculty for more than 10 years (Table 1). Doctors reported a variety of practice descriptions. Most respondents ( $n = 13$ ) describe their practices as a general practice, five as a sports practice, and two as pediatric.

With respect to technique systems used in practice, all clinicians responded that they use Diversified technique and roughly one third reported that they use massage therapy in private practice. When asked about other special areas of practice activities, all respondents reported that they provide rehabilitation or exercise to their patients, and a variety of other special interests were reported (Table 1).

### Data Synthesis

For the sake of simplicity, and to better identify differences in utilization rates, the five options (rarely used, seldom used, occasionally used, frequently used, and very frequently used) were collapsed into three categories. These were: 1) rarely or seldom used, 2) occasionally used, and 3) frequently or very frequently used.

## Diagnostic Procedures: General Inputs

When surveyed as to the frequency with which they used or required their interns to use “general procedures,” over 80% of respondents frequently or very frequently required their interns to perform (or performed on their own patients) all of the following diagnostic procedures: posture (anterior, lateral, and posterior) and gait analysis (heel and toe walking). These percentages approached 90% when “occasionally used” responses were included in the data (Table 2).

Clinicians either performed or required their interns to perform lumbar ranges of motion (active, passive, and resisted), sensory testing, motor testing, soft tissue palpation, and lower deep tendon reflexes virtually 100% of the time during low back assessments. In declining order, clinicians were less likely to require students to test upper limb deep tendon reflexes, tandem gait, muscle girth, or spinous percussion “frequently or very frequently” on their low back patients.

With respect to Waddell’s tests, clinicians perform or require their interns to perform these tests “occasionally” or “frequently/very frequently” in roughly equal numbers, ranging from 30% to 47% (Table 2). Similarly, clinicians required interns to perform joint play less frequently than other “general” procedures with the exception of lateral spinous challenge, which all respondents required interns to perform “frequently or very frequently.” Leg length analysis (true or apparent) or the Gillet motion palpation tests (which purportedly inform an examiner about sacroiliac motion) were “rarely or seldom” used.

## Orthopedic Tests

The use by clinicians and requirement by clinicians for students to perform what is considered to be the core orthopedic testing for low back patients is readily apparent from the data set (Table 3). Specifically, all respondent clinicians use and require their interns to “frequently or very frequently” perform Kemp’s test (standing test for joint dysfunction with the patient extended and posteriorly rotated), straight leg raise (SLR), sacroiliac (SI) compression, Patrick Fabere’s test, and Yeoman’s test. Other tests frequently or very frequently required to be performed by students (over 80% of the time) include crossed SLR, Braggard’s, Bowstring’s, Gaenslen’s, sciatic notch tenderness, Valsalva

maneuver, and spinous tenderness. Psoas palpation and Trendelenburg’s sign are required to be performed slightly less often. Essentially, side-lying SI compression, Minor’s sign, the open-book test, and the Herron-Pheasant test are all equally split between “occasionally” and “frequently/very frequently” used by students under clinician supervision or by the clinician. The only tests used “rarely/occasionally” during low back examinations were Schober’s test and pedal pulse.

## Diagnostic Testing

In general, clinicians “rarely or seldom” or, at most, “occasionally” perform or require students to perform abdominal palpation, with the exception of the kidney punch test (Table 4). Clinicians were asked if they use or require their students to perform certain diagnostic tests ubiquitous in the profession but not taught at the college, such as bilateral weight scale, surface EMG, thermography, prone/supine leg check, and x-ray line markings. All of these tests were “rarely or seldom” required to be used with the exception of prone/supine leg checking, which scored slightly more frequently (Table 5).

## Therapeutic Procedures

The majority of mobilization procedures taught to students during their undergraduate training are used by clinicians or by their interns, albeit at varying frequencies (Table 6). With the exception of iliocostal, iliotransverse, and iliofemoral, the mobilizations taught to students in technique classes are “frequently or very frequently” required to be used between 41% and 64.7% of the time; these percentages approach 80%–90% when “occasionally” responses are included in the data. Only three spinal adjustments taught in the undergraduate technique courses (lumbar roll, lumbar pull, and upper SI) were used or were required to be used over 80% of the time “frequently or very frequently” on low back condition patients (Table 7). Most of the other manipulations/adjustments were used at varying frequencies, with the exception of the disc opening and reverse roll, which were reportedly used or required to be used “rarely or seldom” almost 60% of the time.

**Table 5. Use in private practice and/or requirement for interns by clinicians to perform tests not taught in undergraduate program**

Procedures Not Included	Rarely/Seldom (%)	Occasionally (%)	Frequently/Very Frequently (%)
Bilateral weight scales	100.0		
Surface EMG	93.3	6.7	
Thermography	100.0		
Prone/supine leg check	66.7	20.0	13.3
X-ray line marking	100.0		

**Table 6. Use in private practice and/or requirement by clinicians for interns to perform mobilizations of the lumbopelvis as taught in undergraduate program**

Mobilizations	Rarely/Seldom (%)	Occasionally (%)	Frequently/Very Frequently (%)
Flexion	11.8	23.5	64.7
Extension	23.5	23.5	52.9
Rotation	11.8	11.8	76.5
Rotation–flexion	29.4	23.5	47.1
Rotation–extension	29.4	23.5	47.1
Lateral flexion	11.8	23.5	64.7
Prone iliomammillary	11.8	23.5	64.7
Long axis distraction	6.3	43.8	50.0
Iliotransverse	11.8	52.9	35.3
Iliocostal	17.6	47.1	35.3
Sacral pump	17.6	41.2	41.2
Iliofemoral	29.4	41.2	29.4

## DISCUSSION

The curriculum at the Canadian Memorial Chiropractic College can be described as a diversified, generic, nonproprietary chiropractic approach, with an emphasis on symptom classification, diagnostic acumen, and an eclectic group of therapies for patient care. Outcome measures of primary importance include pain and/or symptom resolution, restoration of normal functional motion, and a return to preincident activities of daily living. The program emphasizes a biopsychosocial approach, with therapies tailored to the special needs of a patient.

Diagnostic procedures are taught in a number of undergraduate courses, primarily in the clinical diagnosis and applied chiropractic departments. In the applied chiropractic (technique) department, for example, there are three year-long psychomotor skills labs, one in each academic year. The psychomotor skill courses are arranged in such a way that the more basic skills are taught before more complex

skills and that diagnostic skills are taught prior to therapeutic skills. Courses in the clinical diagnosis department are similarly arranged.

The selection of which assessment tools and therapeutic maneuvers are taught to students is largely a product of several different factors. Among these factors are the ideology or philosophy of the college at that time, requirements set by accrediting and regulatory bodies, incorporation of information from peer-reviewed clinical trials and research, and the historical accumulation of the preferences of past instructors and tutors. Regardless of the methods and procedures taught, however, there should be considerable curricular harmony between both the undergraduate and clinical internship programs in order to provide a smooth transition between the two.

One may speculate that the apparent discrepancy between some procedures taught during the undergraduate program and those procedures that clinicians either use in their own practices or expect their students to perform lies in different practice



**Table 7. Use in private practice and/or requirement by clinicians for interns to perform spinal adjustments/manipulations of the lumbopelvis as taught in undergraduate program**

Technique Adjustments	Rarely/Seldom (%)	Occasionally (%)	Frequently/Very Frequently (%)
Lumbar roll		11.8	88.2
Lumbar push	23.5	17.6	58.8
Bonyun		50.0	50.0
Lumbar pull	5.9	11.8	82.4
Seated lumbar	23.5	58.8	17.6
Reverse roll	58.8	35.3	5.9
Disc opening	64.7	23.5	11.8
Upper SI (PSIS contact)	5.9	11.8	82.4
Lower SI (ischial contact)	17.6	35.3	47.1
Sacral base	29.4	17.6	52.9
Sacral apex	35.3	41.2	23.5
Prone SI	25.0	50.0	25.0

PSIS = posterior superior iliac spine.

activities of some clinicians. For example, those clinicians who more commonly perform independent chiropractic examinations (ICEs) may more regularly perform Waddell's tests than those clinicians who are in a more general practice. Similarly, perhaps those clinicians who report to use Activator or Thompson Terminal Point techniques may perform supine or prone checking more commonly than clinicians who did not ascribe to a particular technique system. Lastly, the high differences with respect to abdominal palpation frequencies may be a reflection of several factors, not the least of which is that some clinicians are tutors in the courses that instruct students how to perform these tests in the undergraduate program and therefore may have a greater affinity toward them.

The concept of how well a curriculum prepares students for their future endeavors following graduation is an important one that can be applied to various educational institutions regardless of the subject matter. This ties into what has been colloquially referred to as "vertical integration." A literature search was conducted between January 1984 and March 2009 using the following databases: MEDLINE, CINAHL, AMED, Alt Healthwatch, Index to Chiropractic Literature, and MANTIS. The key words used in this search were curriculum, chiroprac\*, utilization, undergraduate program, survey, vertical integration, prepared, and procedures taught. The Cochrane Library was also searched. In certain instances, the key words were combined to limit the amount of articles obtained because the findings were not specific to the chiropractic

profession. In general, this search yielded very few articles, indicating a relative paucity of information on this topic.

Dahle et al define vertical integration as a process that meshes basic sciences with clinical subjects.<sup>2</sup> Arnold and Willoughby, who examined the curricular integration at the University of Missouri and the Kansas City School of Medicine, posit that early clinical exposure will increase context as well as relevance, thereby ensuring a deeper level of learning.<sup>3</sup> Another study done by Wilkerson and Abelman surveyed Harvard graduates in a health sciences program and reported that the most frequently reported reason that medical students appreciated their studies was the emphasis on integration between basic sciences and clinical (practical) medicine.<sup>4</sup>

With respect to vertical integration of curriculum content at chiropractic colleges, Nyiendo and Haldeman reported in 1985 that, in their study based on surveys of new patients and interns at Western States Chiropractic College, there were inconsistencies with respect to interns' practice activities.<sup>5</sup> Based on the data obtained, the authors of that study posited that certain therapeutic modalities (notably electrotherapy and lifestyle counseling) were clearly underutilized and interns rarely sought out advice in diagnosing or treating patients, and they were generally unable to successfully predict the number of treatments that would be required to manage a particular patient. Equally interesting was the observation that interns used 30 different approaches, or combinations of diagnostic procedures, to reach the

same diagnosis (lumbosacral strain only) in the 179 patients presenting with low back pain.

Another study by Leone examined the relationship between time spent teaching various manual procedures at two different chiropractic colleges in Texas and the use by field doctors of those procedures in the graduate clinical environment.<sup>6</sup> Doctors surveyed were licensed graduates between 1988 and 1993. The author reported some differences between the colleges with respect to perceived use of Activator, Thompson Terminal Point, Gonstead, and flexion–distraction techniques. The author concluded that there was sufficient evidence to indicate a relationship exists between manual procedures taught and the perceived use of those procedures during clinic practice.

Saranchuk and Watkins conducted a study at the Canadian Memorial Chiropractic College between 1993 and 1998 whereby the link between education and professional practice was assessed via a survey given to alumni who graduated during that time frame.<sup>7</sup> The alumni were asked to respond with regards to how well they believed the undergraduate program at the college had prepared them for professional practice. That study focused on specific courses taught, such as anatomy, biochemistry, and psychology, and assessed the amount of time, appropriateness of content, and other factors pertaining to each. The results of this study indicated that the undergraduate program had prepared the alumni for professional practice overall, leading the authors to opine, “The data collected support the assumption that a linkage exists between undergraduate education and professional practice” (p. 230). However, this study did not investigate the degree of integration between the undergraduate program and clinical internship. Moreover, the authors of that study reported that respondents opined that too much time was allocated in their undergraduate training to some courses, notably embryology and histology.

Draper and Walsh recently surveyed graduates of a chiropractic program in Victoria, Australia.<sup>8</sup> The authors of that study sought to document the views of graduates with respect to their personal educational experience, present utilization of skills and knowledge acquired during their training, and their opinions on the future education needs of the profession. The results showed overall agreement that they had received the appropriate level of training in most of the elements listed in the survey with the exception of physiological therapeutics, magnetic resonance imaging, philosophy, and

public health. Student respondents also perceived that they received too much training in biochemistry and histology, not unlike the results obtained by Saranchuk and Watkins described above.

## Limitations

There were several limitations of this study. Not all clinicians participated in the survey. Had all clinicians done so, the response frequencies may have been quite different. More importantly, it is possible we erred when we assumed that what practitioners do for their patients in private practice will include the same diagnostic and therapeutic procedures that they require interns to perform under their supervision. For example, field doctors may be more focused in their own practices, have learned which procedures are more reliable by virtue of accrued clinical acumen, and may not, subsequently, perform all core assessment procedures that they require their interns to perform. That is to say, although field doctors may actually rarely perform certain tests on their own patients (ie, lower limb reflexes), they may nonetheless feel compelled to require students to perform them on patients under their supervision since clinicians are, in turn, scrutinized by clinical directors, accrediting agencies, and each other. Moreover, clinicians certainly wish to instill good doctoring skills in the interns under their supervision. Bearing this in mind, now that a baseline data set has been obtained, future studies could separate responses between “what the clinician does in practice” and “what the clinician requires interns under his or her supervision to do.” Lastly, future studies could include a survey option of “never performed” as well.

## CONCLUSIONS

Overall, there appears to be continuity between those procedures taught in the undergraduate program at the Canadian Memorial Chiropractic College and those procedures that either clinicians expect their interns to perform or that they themselves use for patient care, with the exception of the Gillet tests of SI motion, abdominal palpation, Waddell testing, leg length analysis, and some manual therapies. Future studies ought to determine the reasons for these discrepancies and whether or not they necessitate a reallocation of time spent on teaching these procedures. Finally, this study should be replicated

to gather similar data on diagnostic and therapeutic procedures of other parts of the body, particularly the cervical and thoracic spine as well as the joints of the extremities.

## CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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### About the Authors

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