Proceedings for a conference on
Translating Evidence into Practice

Planning Committee & Program Directors:

**Brian Nook DC, DACBSP, ICSSD, FICC**
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Faculty of Health Sciences, Murdoch University
Perth, Western Australia

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European Council on Chiropractic Education, Norway

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Life University, Marietta, Georgia, USA

**Michael Wiles DC, BS, MEd, FCCS(C)**
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Northwestern Health Sciences University
Bloomington, Minnesota, USA

**Kurt Wood DC**
Vice-Chancellor for Clinic Affairs
Palmer College of Chiropractic, Davenport, IA, USA

**26-29 September, 2012**
Rendezvous Hotel Perth and Murdoch University
Perth, Western Australia
TABLE OF CONTENTS

Welcome Letter .................................................................................................................. viii
Conference Supporters ...................................................................................................... ix
Acknowledgements .......................................................................................................... xi
Full Program ...................................................................................................................... xiii
Conference Floor Plan, Rendezvous Hotel Perth ...........................................................(xix
Notice & General Conference Information ...................................................................... xxi

DAY 1 - SESSION ONE - THEME 1

The Practitioner’s Perspective: The Balance Between Research Evidence and Clinical Experience.
   Jakob Lothe DC ........................................................................................................ 1

The Patient’s Perspective.
   Gio Terni LLB ........................................................................................................ 3

DAY 1 - SESSION ONE - THEME 2

Strategies to Translate Evidence into Education and Practice.
   Christine Goertz DC, PhD ........................................................................................ 4
   Simon French BAappSc(Chiro), PhD, MPH ............................................................. 6

DAY 1 - CONCURRENT SESSION 1.1

Utilizing a ‘General Semantic’ Conceptual ‘Map’ in the Practice of ‘Critical Thought’ in Evidence-Based Teaching.
   Sharyn Eaton DC, PhD ........................................................................................... 7

   John Triano DC, PhD (Anthony Tibbles DC, BSc, FCCS (C)) .................................... 10

Selecting Which Evidence to Use in the Long Haul Practice: A View from the Field
   Dennis Richards DC, BSc ......................................................................................... 12
DAY 1 - CONCURRENT SESSION 1.1 cont’d

Extension in Chiropractic Education: A Tool in Introducing Patient Values and Preferences in the Evidence-Based Practice Paradigm.
Ricardo Fujikawa DC, MD.................................................................................................................. 13

Computer-Aided Assessment of Chiropractic Students’ Radiology Interpretation Skills.
Michael Haneline DC, MPH (Michael Hubka DC, FCCS)................................................................. 15

Teaching Ophthalmoscopy in Chiropractic Schools – Where is the Evidence?
Robyn Beirman MB BS (Hons), MHPed.................................................................................................. 18

DAY 1 - CONCURRENT SESSION 1.2

Identifying Barriers and Enablers to the Uptake of Evidence-Based Guidelines for Acute Low-Back Pain by Australian Chiropractors: A Qualitative Study Using a Theoretical Framework.
Simon French BAppSc(Chiro), PhD, MPH............................................................................................. 21

Assessment of Competence in Evidence-Based Practice: Controversies and Challenges?
John Hyland DC, MPH, DACBR, DABCO............................................................................................. 23

A Systematic Review of Complementary and Alternative Medicine (CAM) for the Treatment of Headache.
Peter Tuchin GradDipChiro, PhD ............................................................................................................. 26

The Introduction of Flexible Pressure Pad Technology in the Learning and Teaching of Manipulative skills: A Pilot Study to Determine Utility.
David Byfield DC, MPhil (Mark Webster DC, MSc) ............................................................................... 27

Dominic Giuliano DC (Jean Moss DC, MBA)......................................................................................... 30

Translational Research – From Bedside to Bench and Back.
Roger Engel PhD........................................................................................................................................ 32

DAY 1 - CONCURRENT SESSION 2.1

Evidence-Based Practice Implementation: Getting Faculty to Sing from the Same Songbook.
Background Paper (1)
Simon Towler MD
Bruce Walker DC, MPH, DrPH.................................................................................................................. 35
DAY 1 - CONCURRENT SESSION 2.2

Internal and External Influences on Chiropractic Students. The Good, the Bad and the Ugly.
- Background Paper (2)
  - Mike Wiles MS, MEd
  - Eric Russell DC, DPhCS ............................................................. 36, 38

DAY 1 - CONCURRENT SESSION 2.3

Teaching Evidence-Based Practice from a Positive Perspective.
- Background Papers (2)
  - John Stites DC
  - Chris Yelverton MTechChiropractic, ICSSD ........................................... 39, 43

DAY 2 - SESSION 3 - THEME 1

Accreditation Criteria in the USA and the Evidence Supporting Them: An Accreditation Agency Perspective.
- Craig Little DC ................................................................. 49

Accreditation Criteria in the USA and the Evidence Supporting Them: A College Perspective.
- Brian McAulay DC, PhD .......................................................... 51

Accreditation Criteria in Europe and the Evidence Supporting Them.
- Tim Lothe Raven BAppSc, MSc .................................................... 53

Accreditation Criteria in Australia and the Evidence Supporting Them.
- Phillip Donato BAppSc(Chiro), CCSP ............................................. 55

DAY 2 - SESSION 3 - THEME 2

A Review of Orthopedic Tests.
- Joe Lemire DC, MSc, FCCS ...................................................... 58

- Mark Webster DC, MSc .......................................................... 59
DAY 2 - SESSION 3 - THEME 2 cont’d

A Review of Neurology Tests.
Kelly Holt DC, BSc ................................................................. 62

DAY 2 – CONCURRENT SESSION 3.1

Diffusion of Innovation: An EBCP Faculty Development Program for Chiropractic College Faculty.
Cynthia Long PhD ............................................................................. 64

The 4-Year Evolution of a Workshop on Evidence-Based Clinical Practice for Chiropractic College Faculty
John Stites DC ..................................................................................... 67

Problems Implementing EBP.
Barry Draper BAppSc(Chiro), MSc ..................................................... 70

Anatomy as a Medium for the Development of Research Skills for Chiropractic Students.
Goran Strkalj PhD ........................................................................... 72

What Level of Anatomy for Chiropractic Students?
Bruce Walker DC, MPH, DrPH (Peter Chapman DC) ..................................... 74

The Double-Edged Sword of Chiropractic Semantics.
Sharyn Eaton DC, PhD ....................................................................... 77

DAY 2 - CONCURRENT SESSION 3.2

Factors that Increase the Risk of CVA after CSMT.
Peter Tuchin GradDipChiro, PhD .............................................................. 79

An Evidence-Based Health Promotion Activity, Developed with Professional Consensus: 'Just Start Waling'.
John Hyland DC, MPH, DACBR, DABCO .................................................. 80

The Evaluation of Lumbar Multifidus Function via Palpation: Reliability and Validity of a New Clinical Test.
Jeffrey Hebert DC, PhD, DACBSP ......................................................... 83
DAY 2 - CONCURRENT SESSION 3.2 cont'd

The Chiropractic Care of Children in Europe: Results from a Practice-Based Research Network.
Joel Alcantara DC .................................................................................................................. 86

Translating Evidence into Practice in a Chiropractic Setting: Improving Care through Better Understanding of Current Practice.
Simon French BAppSc(Chiro), PhD, MPH.............................................................................. 90

DAY 2 - CONCURRENT SESSION 4.1

Producing New Graduates who can Cope in Traditional Clinical Environments.
Background Paper (1)
Deborah Kopansky-Giles DC, MSc
Max Sully PhD ...................................................................................................................... 92

DAY 2 - CONCURRENT SESSION 4.2

Optimal Characteristics of Supervising Clinicians.
Background Paper (2)
Anthony Tibbles DC, BSc, FCCS(C)
Henrik Lauridsen MSc (Chiro), PhD .................................................................................. 101, 110

DAY 2 - CONCURRENT SESSION 4.3

The Roles of Graduate Education Programs and the Habit of Life-Long Learning in Reinforcing Evidence-Based Practice.
Background Paper (2)
Charmaine Korporaal MTechChiropractic, ICSSD
Lise Lothe DC ...................................................................................................................... 111, 112

DAY 3 - SESSION 5

Teaching Manual Techniques and Therapies: How to Educate Students about those with Limited Evidence.
Charlotte LeBoeuf-Yde DC, MPH, PhD .............................................................................. 116
David Byfield DC, MPhil (Mark Webster DC, MSc) ......................................................... 119
Morgan Young DC ............................................................................................................. 123
DAY 3 - CONCURRENT SESSION 5.1

Proprietary Technique Systems and their Influence on Chiropractic Education Today. What are the Influences, and How Do We Best Respond?
Background Paper (2)
Rick Ames DC, BSC, ICSSD
Daryl Ridgeway DC................................................................. 125, 129

DAY 3 - CONCURRENT SESSION 5.2

What Should be the Roles of Plain X-Ray and Other Imaging Modalities in Chiropractic Education Today? What is the Evidence, what are the Trends, what Recommendations does the conference have?
Background Paper (2)
Craig Moore BAppSc
Kenneth Young MAppSc, DACBR (Jeffrey Cooley DC, DACBR) ................................. 134, 145

DAY 3 - CONCURRENT SESSION 5.3

Role and Application of Simulation in Clinical Training. Does it Work? What are the Models? What does the Evidence Show?
Background Paper (2)
Marion McGregor DC, PhD (Jeffrey Hamdorf MB, PhD)
Claire Langdon PhD................................................................. 150, 160

Appendix A Poster Abstracts ................................................................................................................................... 168-234
26 September, 2012

Dear Colleagues:

On behalf of our three organisations we welcome you to Perth, Murdoch University and this conference on Translating Evidence into Practice.

This conference was planned to bring together many with expertise in evidence-based learning and practice, to review how the relevant principles and habits can be instilled in students during their education and in clinicians during their years in practice. Your response to our invitations and Call for Papers has been outstanding. Thank you. This will now be a most stimulating and valuable meeting – and good fun, given the excellent social program.

Thank you also to our Planning Committee and those who have done the detailed preparation so well – the Program Committee at Murdoch University (comprising Dr Bruce Walker, Dr Deb Nook, Dr Paul Dillon, Dr Jeff Cooley, Dr Jeffrey Hebert, Mrs. Pat Jones and Dr Brian Nook), and the staff at the World Federation of Chiropractic (notably Christina Davis and David Chapman-Smith) and our conference secretariat EECW (notably Debbie-Ann Scott and Jennifer Maninin).

Grateful thanks also to our sponsors, including the US-based International Board of Chiropractic Examiners. This is the seventh such conference sponsored by the IBCE/NBCE. And equally, grateful thanks to our hosts at Murdoch University, led by one of us - Dr Brian Nook, Dean, School of Chiropractic and Sports Science, who deserves the highest plaudits of all.

Sincerely,

Dennis Richards DC
President
World Federation of Chiropractic

Richard Brassard DC
President
Association of Chiropractic Colleges

Brian Nook DC
Member
Consortium of Chiropractic Institutions Asia Pacific
WFC/ACC/CCIAP EDUCATION CONFERENCE: TRANSLATING EVIDENCE INTO PRACTICE

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ACKNOWLEDGEMENTS

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Tim Lothe Raven DC, BAppSC, MSc, FEAC - WFC
Eric Russell DC, DPhCS - CCIAP
Robert Scott DC, PhD - WFC
Michael Wiles DC, BS, Med, FCCS(C) - ACC
Kurt Wood DC - ACC

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Dr Jeffrey Hebert, Senior Lecturer
Dr Paul Dillon, Senior Lecturer
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Mrs Pat Jones, PA to Dean, Working Group Secretary
Dr Deb Nook, Senior Lecturer, WCCS Liaison
Dr Bruce Walker, Senior Lecturer

World Federation of Chiropractic
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Christina Davis, Executive Secretary
Sarah Yabut, Administrative Assistant

Association of Chiropractic Colleges
David O’Bryon, Executive Director

EECW (Conference Secretariat)
Debbie-Ann Scott, Managing Director
Jennifer Maninin, Event Manager
Emma Pawley, Event Coordinator

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Chiropractic, the Consortium of Chiropractic Institutions Asia Pacific, the Association of Chiropractic Colleges
or the National Board of Chiropractic Examiners.
ABOUT THE CAA

See what CAA membership offers you!

With over 2,700 members, the CAA is the largest chiropractic health body in Australia. The CAA is the custodian for the chiropractic profession in Australia and provides a range of membership services including:

**Competitive professional indemnity insurance**
- Non-members can pay up to 30% more than a CAA member with Guild Insurance
- New graduates get an additional reduction of about 25%

**Australia’s largest online search for chiropractors**
- Members are listed on “Locate a Chiropractor”, increasing opportunities with potential patients and referrals from other health professionals

**Clinical interest groups**
- Link up and share knowledge with like-minded professionals through the CAA’s special interest groups, including Sports Chiropractic Australia.

**Public education & promotion**
- The CAA provides the most comprehensive range of promotional tools in Australia to increase the profile of the profession.
- CAA members’ will have access to flagship campaigns including Spinal Health Week, Sit Right, Straighten Up Australia & Just Start Walking.

**Member-only publications**
- The Australian Chiropractor magazine each month
- Chiropractic Journal of Australia quarterly

**Cost-effective, quality CPD**
- Exclusive member rates for National Development Forum (earn all your Formal Learning hours in one weekend)

Plus member-only resources online, endorsed product offers, chiropractic research and so much more...

CAA

HEALTHY SPINE, HEALTHIER LIFE.
# WFC ACC CCIAP Education Conference: Translating Evidence into Practice

## 26th – 29th September 2012

Rendezvous Hotel and Murdoch University, Perth, Western Australia

### Wednesday 26th September 2012

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>8.00am-12.00pm</td>
<td>Exhibition Build - Rendezvous Hotel Perth</td>
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<tr>
<td>2.00pm-4.00pm</td>
<td>Exhibitor Bump-In – Rendezvous Hotel Perth, Ballroom</td>
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<tr>
<td>4.00pm–8.00pm</td>
<td>Pre-registration – Rendezvous Hotel Perth, Ocean Plaza, Pre-Function Area</td>
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<tr>
<td>6.00pm–8.00pm</td>
<td>Welcome Reception – Rendezvous Hotel Perth, sponsored by Chiropractors’ Association of Australia</td>
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<td>Rest of night free</td>
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### Thursday 27th September 2012

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<th>Time</th>
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<tbody>
<tr>
<td>7.30am-5.30pm</td>
<td>Registration Open, Rendezvous Hotel Perth, Ballroom, Pre-Function Area</td>
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<tr>
<td>8.30am</td>
<td>Welcome Addresses: WFC and ACC Presidents</td>
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<td>Opening Address: Simon Towler (MC - Western Australia)</td>
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<tr>
<td>8.45am-9.30am</td>
<td>Plenary Session 1. Theme 1: Teaching in the Context of the Evidence: What is Evidence-Based-Practice and Why is it Important?</td>
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<td>Chair: Jeffrey Hebert (Murdoch U - Australia)</td>
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<td>This session will provide a broad introduction to the logic of evidence-based practice and the role of evidence in education.</td>
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<tr>
<td>8.45am</td>
<td>What is Evidence Based-Practice and Why is it Important? Mellick Chehade (U Adelaide - Australia)</td>
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<td>9.00am</td>
<td>The Practitioner’s Perspective: The Balance Between Research Evidence and Clinical Experience. Jakob Lothe (NCA President - Norway)</td>
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<td>9.15am</td>
<td>The Patient’s Perspective. Gio Terni (Health Consumers’ Council – Australia)</td>
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<td>9.30am-10.30am</td>
<td>Plenary Session 1. Theme 2: Translating Evidence into Education and Practice: How do we change?</td>
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<td>Chair: Mellick Chehade (U Adelaide - Australia)</td>
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<td>This session will address the relationships between clinical research evidence and education and practice. Changing practice has proven a challenging endeavour in chiropractic and the health professions in general. Speakers in this session are recognized experts in the areas of translational research, and will present specific strategies to overcome this common problem.</td>
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<tr>
<td>9.30am</td>
<td>Strategies to Translate Evidence into Education and Practice. Christine Goertz (Palmer – USA)</td>
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<td>9.45am</td>
<td>Strategies to Translate Evidence into Education and Practice. Simon French (U Melbourne - Australia)</td>
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<td>10.00am</td>
<td>Audience Discussion</td>
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### Thursday 27th September 2012 cont’d

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<th>Time</th>
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<tr>
<td>10.30am-11.00am</td>
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<td><strong>Concurrent Sessions</strong></td>
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<td></td>
<td><strong>Concurrent Session 1.1 Podium Presentations (Ballroom)</strong></td>
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<td><strong>Chair:</strong> Goran Strkalj (Macquarie U - Australia)</td>
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<td><strong>Theme:</strong> EDUCATION RESEARCH-From Call for Papers</td>
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<td><strong>Primary Audience:</strong> Educationalists</td>
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<td>3. Dennis Richards, Selecting Which Evidence to Use in the Long Haul Practice: A View from the Field. (Private Practice – Australia).</td>
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<td>4. Ricardo Fujikawa, Extension in Chiropractic Education: A Tool in Introducing Patient Values and Preferences in the Evidence-Based Practice Paradigm. (RCU Maria Cristina – Spain).</td>
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<td><strong>Concurrent Session 1.2 Podium Presentations (Harbour Suites A/B)</strong></td>
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<td><strong>Chair:</strong> Cynthia Long (Palmer - USA)</td>
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<td><strong>Theme:</strong> CLINICAL RESEARCH-From Call for Papers</td>
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<td><strong>Primary Audience:</strong> Clinicians</td>
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<td>4. David Byfield (Mark Webster), The Introduction of Flexible Pressure Pad Technology in the Learning and Teaching of Manipulative Skills: A Pilot Study to Determine Utility. (U Glamorgan – UK).</td>
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<td>11.00am-12.30pm</td>
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<td><strong>Concurrent Session 2.1 Podium Presentations (Ballroom)</strong></td>
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<td><strong>Theme:</strong> Teaching Evidence-Based Practice from a Positive Perspective.</td>
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<td><strong>Primary Audience:</strong> Educators</td>
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<td><strong>Moderators:</strong> Chris Yelverton (UJ – South Africa) and John Stites (Palmer – USA)</td>
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<td>Do all staff value evidence-based teaching approaches? If not, how do we approach this issue?</td>
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<td>12.30pm-1.30pm</td>
<td>LUNCH BREAK &amp; Poster Viewing</td>
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<td><strong>Concurrent Workshops</strong></td>
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<td><strong>Concurrent Session 2.2 (Ballroom)</strong></td>
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<td><strong>Theme:</strong> Internal and External Influences on Chiropractic Students. The Good, the Bad and the Ugly.</td>
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<td><strong>Moderators:</strong> Mike Wiles (NWHSU – USA) and Eric Russell (NZCC – New Zealand)</td>
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<td>What factors influence chiropractic students’ attitudes and beliefs?</td>
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<td><strong>Concurrent Session 2.3 (Ballroom)</strong></td>
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<td><strong>Theme:</strong> Internal and External Influences on Chiropractic Students. The Good, the Bad and the Ugly.</td>
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<td><strong>Moderators:</strong> Mike Wiles (NWHSU – USA) and Eric Russell (NZCC – New Zealand)</td>
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<td>Many students and clinicians are apprehensive about evidence-based practice. What strategies can be used to help overcome this challenge?</td>
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**Thursday 27th September 2012 cont’d**

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<td>3.30pm-4.00pm</td>
<td><strong>AFTERNOON TEA &amp; Poster Viewing</strong></td>
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| (Ballroom)    | Plenary Session 2. Panel Discussion and Debate: What should be the Focus of Chiropractic Education and Practice? | Moderator: Ricardo Fujikawa (RCU Maria Cristina – Spain)  
What changes, if any, are needed to traditional chiropractic practice? What impacts, if any, does this have on current chiropractic education? |
| 4.00pm-5.30pm |                                                                      |
| Friday 28th September 2012 |                                                                 |
| 8.00am-3.30pm | **Registration Open**                                                 |
| 8.45am-9.45am | Plenary Session 3. Theme 1: Do Accreditation Criteria Meet the Needs of the Profession in 2012?  
Chair: Mark Webster (U Glamorgan – UK)  
Are accreditation criteria for chiropractic education based on evidence and if not, why not? |
| 8.45am        | Accreditation Criteria in the USA and the Evidence Supporting Them: An Accreditation Agency Perspective. Craig Little (CCEI – USA) |
| 9.00am        | Accreditation Criteria in the USA and the Evidence Supporting Them: A College Perspective. Brian McAulay (Life U – USA) |
| 9.15am        | Accreditation Criteria in Europe and the Evidence Supporting Them. Tim Lothe Raven (ECCE – Europe) |
| 9.30am        | Accreditation Criteria in Australia and the Evidence Supporting Them. Phillip Donato (CBA - Australia) |
| 9.45am-10.30am| Plenary Session 3. Theme 2: Teaching Physical Examination and Diagnostic Tests.  
Chair: Charlotte LeBoeuf-Yde (USD – Denmark, IFEC - France)  
Many diagnostic tests traditionally used by chiropractors have suboptimal evidence to support their use. What level of evidence identifies a diagnostic test as valid or invalid, and at what point and how do we let go of those that are unsupported by the evidence? |
| 9.45am        | A Review of Orthopedic Tests. Joe Lemire (UQTR - Canada) |
| 10.00am       | A Review of Palpation and Manual Tests. Mark Webster (U Glamorgan – UK) |
| 10.15am       | A Review of Neurology Tests. Kelly Holt (NZCC - New Zealand) |
| 10.30am–11.00am| MORNING TEA & Poster Viewing                                          |
### Concurrent Sessions

**Concurrent Session 3.1 Podium Presentations (Ballroom)**
Chair: Michael Hubka (IMU - Malaysia)
Theme: EDUCATION RESEARCH – From Call For Papers
*Primary Audience: Educationalists.*
1. Cynthia Long, *Diffusion of Innovation: an EBCP Faculty Development Program for Chiropractic College Faculty.* (Palmer U – USA).
2. John Stites, *The 4-Year Evolution of a Workshop on Evidence-Based Clinical Practice for Chiropractic College Faculty.* (Palmer U – USA).

**Concurrent Session 3.2 Podium Presentations (Harbour Suites A/B)**
Chair: HanSuk Jung (Hanseo U - Korea)
Theme: CLINICAL RESEARCH – From Call For Papers
*Primary Audience: Clinicians.*
1. Peter Tuchin, *Factors that Increase the Risk of CVA after CSMT.* (Macquarie U – Australia).

**Concurrent Workshops**

**Concurrent Session 4.1 (Ballroom)**
Theme: Producing New Graduates who can Cope in Traditional Clinical Environments.
Moderators: Deborah Kopansky-Giles (CMCC – Canada) and Max Sully (Murdoch U – Australia)
New graduates educated in an evidence-based practice model often work alongside experienced chiropractors trained in a different paradigm. How can we help our students and practitioners to be better prepared to manage this potential conflict?

**Concurrent Session 4.2 (Harbour Suites A/B)**
Theme: Optimal Characteristics of Supervising Clinicians
Moderators: Anthony Tibbles (CMCC - Canada) and Henrik Lauridsen (USD – Denmark)
What characteristics identify excellence in clinical supervision, and how can we seek, recruit and retain clinical staff?

**Concurrent Session 4.3 (Harbour Suites C)**
Theme: The Roles of Graduate Education Programs and the Habit of Life-long Learning in Reinforcing Evidence-based Practice.
Moderators: Lise Lothe (EAC – Norway) and Charmaine Korporaal (DUT - South Africa)
GEPs, as in Europe and South Africa, provide extended training. Undergraduate education and CPD/CE should instil habits of life-long learning. How can such education best influence evidence-based practice?
**Friday 28th September 2012 cont’d**

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<th>Time</th>
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<tbody>
<tr>
<td>3.15pm (sharp)</td>
<td>Travel to Murdoch University (Coach)</td>
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<tr>
<td>3.45pm</td>
<td>Arrival at Bush Court, Murdoch University</td>
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<tr>
<td>4.00pm</td>
<td>Welcome: Emeritus Professor Jim Reynoldson, Murdoch University Plenary Session 4. Subluxation - The Evidence, and How do we Instruct Students about this Entity? Moderator: Robert Scott (Life U - USA) Panellists: Oystein Ogre (ECU - Norway) Heidi Haavik (NZCC - New Zealand) Ricardo Fujikawa (RCU Maria Cristina - Spain) 10 minute presentations, followed by plenary and audience discussion.</td>
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<tr>
<td>5.10pm</td>
<td>Guided Tour of Murdoch University Facilities, sponsored by Visual Outcomes</td>
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<tr>
<td>6.00pm-11.00pm</td>
<td>River Dinner Cruise and Return to Hotel (Coach). sponsored by Chiropractic and Osteopathic College of Australasia</td>
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<td>Coach departs the University (arrives at Barrack Street Jetty)</td>
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<td>Cruise departs Barrack Street Jetty</td>
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<td>Coach departs Barrack Street Jetty (arrives at Rendezvous Hotel)</td>
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**Saturday 29th September 2012**

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<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>8.00am-5.00pm</td>
<td>Registration Open</td>
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<tr>
<td>9.00am-10.00am</td>
<td>Plenary Session 5. Theme: Teaching Manual Techniques and Therapies: How to Educate Students about those with Limited Evidence Chair: Brian Nook (Murdoch U - Australia)</td>
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<tr>
<td>9.00am</td>
<td>First Presentation. Charlotte LeBoeuf-Yde (USD - Denmark, IFEC - France)</td>
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<tr>
<td>9.15am</td>
<td>Second Presentation. Mark Webster (U Glamorgan - UK)</td>
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<tr>
<td>9.30am</td>
<td>Third Presentation. Morgan Young (Palmer - USA)</td>
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<tr>
<td>9.45 – 10.00am</td>
<td>Panel and Audience Discussion</td>
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<tr>
<td>10.00am-10.30am</td>
<td>MORNING TEA</td>
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<tr>
<td>Concurrent Workshops 10.30am-12.00pm</td>
<td>Concurrent Session 5.1 (Ballroom) Theme: Proprietary Technique Systems and their Influence on Chiropractic Education Today. What are the Influences, and How Do We Best Respond? Moderators: Rick Ames (RMIT U – Australia) and Daryl Ridgeway (Logan - USA)</td>
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<td>Concurrent Session 5.2 (Harbour Suites A/B) Theme: What Should be the Roles of Plain X-ray and Other Imaging Modalities in Chiropractic Education Today? What is the Evidence, what are the Trends, what Recommendations does the Conference have? Moderators: Jeffery Cooley (Murdoch U - Australia) and Craig Moore (CAA – Australia)</td>
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<td>Concurrent Session 5.3 (Harbour Suites C) Theme: Role and Application of Simulation in Clinical Training. Does it work? What are the Models? What does the Evidence show? Moderators: Jeffrey Hamdorf (U Western Australia – Western Australia) and Claire Langdon (Department of Health – Western Australia).</td>
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<td>12.00pm-1.00pm</td>
<td>LUNCH BREAK</td>
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<td>1.00pm-1.30pm</td>
<td>Snapshot of Posters Speaker: Charlotte LeBoeuf-Yde (USD – Denmark, IFEC – France)</td>
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| 1.30-3.00pm  | Summary of Workshops by Workshop Moderators  
| (Ballroom)   | Presentation of conclusions reached during workshop sessions during the past 3 days. |
| 3.00pm-3.30pm| AFTERNOON TEA     |
| 3.30pm       | Forum in Review   
|              | Panel and then audience discussion. |
| 4.45pm       | Next Forum        
|              | Presentation by the organisers of the next conference. |
| 5.00pm       | Close             |
Murdoch University and the School of Chiropractic and Sports Science are proud supporters and hosts of the WFC/ACC/CCIAP Education Conference, Translating Evidence into Practice.

www.murdoch.edu.au
Notice of Education Conference

Hosts:
Murdoch University and Chiropractors’ Association of Australia

Title
Translating Evidence into Practice

Location
Rendezvous Hotel and Murdoch University
Perth, Western Australia

Dates
Wednesday, 26 September to Saturday, 29 September, 2012

Subject and Program
The educational and healthcare world is increasingly aligned with evidence-based practice. What is being done and what must be done by the chiropractic profession in undergraduate, graduate, and continuing education to meet the needs of students, clinicians, and patients? This conference will address all aspects of the subject. See the program for the themes of plenary sessions, workshops and other presentations.

Location
Previous WFC/ACC Conferences have been held in Asia, Europe, Latin America, and North America. The Rendezvous Hotel and Murdoch University in Perth, Western Australia have been chosen because the organizers wanted a venue in Australia and because the School of Chiropractic and Sports Science at Murdoch University, a large public university with several health science programs, is an environment that lends itself to the subject of translating evidence into practice.
Goals
Improved understanding and adoption of principles of evidence-based practice in chiropractic education through discussion of all relevant topics, including:

- What EBP is and why it is important.
- The roles of clinical research, clinical experience, and patient values.
- Translating evidence into educational practice – experience in chiropractic and other health science programs.
- Curriculum and faculty development.
- External influences on curriculum, including evidence for accreditation criteria.
- Inter-professional education and issues.
- Graduate and post-graduate education.
- Promoting habits of life-long learning

Methods
There will be a combination of:

1. Lectures. Invited lectures in key areas.
2. Paper Presentations. Presentations selected from individuals responding to the Call for Papers.
3. Workshops. Concurrent afternoon workshops on specific themes, informed by key papers circulated to attendees prior to the workshop sessions.
4. Final Summary. On the final afternoon reports from workshops, conference review and development of consensus statements.

Who should attend?
The conference addresses a subject that is of importance not only to those who are engaged in education but also to practicing chiropractors. Some of the lectures and concurrent workshops are primarily of interest to educators, some to clinicians. The meeting will therefore be of interest not only to leaders and faculty from chiropractic educational institutions but also practicing chiropractors, representatives of chiropractic associations and all interested in the growing impact of evidence-based practice in healthcare and how to respond in the best interests of patients and the profession.

Call for Papers
See the Call for Papers under Events/Meetings at www.wfc.org. The two categories for submission were:

- Educational Research. Papers addressing any topic relevant to an aspect of chiropractic education and preparation of students or practitioners for evidence-based practice.
- Clinical Research. Papers addressing any topic relevant to translating evidence to practice in the context of clinical practice.
General Conference Information

Venue
Rendezvous Hotel Perth
The Esplanade
Scarborough WA 6019
Australia
T: +61 8 9245 1000
W: www.rendezvoushotels.com/perth

In September it is springtime and the climate is superb. It is recommended that delegates arrive early, and leave time for tours of the city, environs and the famous Margaret River wine country before and/or after the Conference. Rendezvous Hotel Perth is also ideally situated for convenient access to the Port City of Fremantle, AQWA (Aquarium of Western Australia), Hillarys Boat Harbour, Rottnest Island, Swan Valley, popular shopping destinations, championship golf courses and 15 minutes away from the CBD.

The Rendezvous Hotel is about 30 minutes by taxi from the airport in Perth and delegates are recommended to travel to the hotel by taxi. Cost is about AUD$45.

Useful Telephone Numbers:
Swan Taxis 13 13 30
Bus & Rail Information 13 62 13
Ambulance: 000
Police 13 14 44

Car Rental:
Budget Rent a Car 13 27 27
Hertz 13 30 39
Avis 13 63 33

Parking
Limited free parking is available on The Esplanade, outside the Conference venue. $10/day parking is available at the venue for in house guests (2pm-2pm the following day) and Conference delegates (arrival time-midnight) with validation available upon request at the hotel reception. Please note the hotel car park height limit of 1.9m. Valet parking is available from the West Coast Highway entrance of the Rendezvous Hotel Perth if required.
Climate
Late September is springtime in Perth and Western Australia with average daytime temperatures of 20-25°C (70-75°F) with warm and mild evenings. These are averages; it may be hotter during the day. The Rendezvous Hotel is on the beach and has outdoor pools. Bring beachwear.

Social Functions:

Welcome Reception
Proudly sponsored by Chiropractors’ Association of Australia
Date: Wednesday, 26 September 2012
Time: 6.00 pm – 8.00 pm
Venue: Ocean Room, Rendezvous Hotel Perth

Swan River Dinner Cruise
Proudly sponsored by Chiropractic & Osteopathic College of Australasia
Date: Friday, 28 September 2012
Time: 7.00 pm – 11.00 pm
Departs: Barrack Street Jetty (Coach will drop delegates off straight after the Murdoch Debate & University Tour)

Australian Barbeque
Date: Saturday, 29 September 2012
Time: 5.00 pm – 8.00 pm
Venue: Ocean Room, Rendezvous Hotel Perth

Murdoch Debate & University Tour
Proudly sponsored by Visual Outcomes
Date: Friday, 28 September 2012
Departure Point: Coach bay outside the Rendezvous Hotel (Esplanade side near the large round-about on Scarborough Beach Road)
Time: Coach leaves 3.15 pm (sharp)

Registration
**On-Site Registration Desk:**
Pre-registration will be located in the Ocean Plaza pre-function area from 4.00 pm – 8.00 pm on Wednesday, 26 September 2012.

From Thursday, the Registration Desk will be located in the Ballroom Pre-function Area and will be staffed as follows:

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**Powerpoint and Speaker Preparation Room**
A Speakers Preparation Room has been set up for the duration of the Conference in the Abrolhos Room (next door to the Ballroom/Plenary Sessions). All presenters are required to check into this room at least 2 hours prior to presentation and provide a copy of the presentation on CD or USB to the technician. Given the large program in place and the number of speakers required to check into this room we suggest you check into the room as soon as possible.

The room will be staffed as follows:

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**Name Badge**
It would be appreciated if delegates wear their name badge at all times as this identifies you as eligible for catering and entry to Conference sessions.

**Meals**
All tea breaks and lunches will be served in the exhibition area (Ballroom Pre-Function Area).

**Special Dietary Requirements**
If you have requested a special meal, please make yourself known to the catering staff who will be able to assist.

**Messages**
The Conference Secretariat will receive all messages, which can be collected from the registration desk. The following contact number can be provided for messages: 0401 039 750. The secretariat will accept no responsibility for undelivered messages.
Dress
Conference Sessions        Smart Casual
Social Functions           Smart Casual
Australian BBQ             Casual

Privacy Statement
In registering for this event relevant details have been incorporated into a delegate list for the benefit of all delegates, ECIA, sponsors and all associated parties directly related to the Conference. If when registering you requested privacy, your personal details will not be provided to outside parties.

Smoking Policy
The Rendezvous Hotel Perth has a no smoking policy throughout the venue. This policy also applies to the majority of restaurants, bars and shopping centres in Perth.

Child Care
Please note that no official arrangements have been made for child care during the Conference. Please check with your hotel who may be able to assist you further with babysitting services during your stay.

Conference Secretariat:
EECW Pty Ltd
PO Box 749, Wembley, WA, 6913
T: (08) 9389 1488
M: +61 401 039 750
Jennifer Maninin, Event Manager
E: jennifer@eecw.com.au
Hold a conference in the beautiful open space of Western Australia with the help of Perth Convention Bureau

**Perth Convention Bureau (PCB)** has been helping not-for-profit associations and agents bring their conferences and incentive groups to Western Australia since 1972. Our charter is to market Western Australia nationally and internationally, in conjunction with local organisations, as a destination for conventions, exhibitions and incentive travel groups.

If you haven’t confirmed the destination for your next business event, but you are considering Western Australia, you could be eligible for significant funding. Contact us for further details.
The Practitioner’s Perspective: The Balance between Research Evidence and Clinical Experience

Jakob Lothe, DC

Norwegian Chiropractors’ Association, Norway

In the whole field of health care services there is an increasing expectation that clinical decision-making should be based on research evidence.

During the last ten years I have contributed in the development, implementation, and revision of multidisciplinary evidence based guidelines for low back pain in Norway.

The key messages that arrived from the back pain guidelines were in good harmony with mainstream Norwegian chiropractic. Hence, the introduction of multidisciplinary guidelines turned out to be a rather pain-free and non-threatening process that undoubtedly has been beneficial and strengthened the role and position of chiropractic in Norway.

However, it is important to realize that the hard knowledge that can be deducted from todays evidence based back pain guidelines is very crude when it comes down to the chiropractor’s day-to day clinical decision-making facing the individual patient with his/her particular needs.

From a practitioners’ perspective the chiropractic clinical setting remains a very rich and complex playground for human interaction on many different levels.

Chiropractors traditionally apply biomechanical interventions by hand intended to improve homeostasis and wellbeing of their patients, but both the lesion (subluxation) and its correction (adjustment) yet remain to be described satisfactorily in strict scientific terms. Hence, chiropractors must still rely very almost entirely on their own individual vision and psychomotor skills in diagnosis, continuous assessment and treatment of patients. The present state-of-the art evidence based guidelines are of very little use in this context.

According to the present body of research it does not seem to make much difference in between treatment methods or modalities, back pain researchers tell us that over-the-counter painkillers are as effective as spinal manipulation, both methods can take your pain away but drugs are cheaper...

At the same time we inherently know as chiropractors through our own clinical experience that a cascade of positive events, often labeled as a “miraculous effect” occur when you do the exactly right thing at the right time to the right patient!
Many chiropractors find it hard to understand and accept that what they perceive as good results in their own clinics fail to be reflected by clinical research. Why is it so?

My suggestion is that the researchers should turn the table and start scrutinizing what constitutes and characterizes the individual chiropractor with reputation for having remarkably good results. From this we might get some useful and possibly also very surprising information.

My own 25 years of clinical experience have made me recognize and acknowledge the need and importance of a phenomenological approach towards the individual patient. A phenomenological approach in this context can be described as “seeing the whole patient” as opposed to the traditional analytical diagnostic approach “finding faults”.

In the world of science, any phenomenon must necessarily be reduced and deconstructed in order to answer a specific research question that is put forward.

This is in my mind the important difference between the roles of the clinician and the researcher. The clinician is the player on the field while the researcher is analyzing the game.

Being able to integrate what we know from research with the very complex phenomenon called a patient is a true privilege and challenge to the clinician. This ability is in my opinion crucial to clinical success.
The Patient’s Perspective: The Balance Between Research Evidence and Clinical Experience

Gio Terni

Health Consumers’ Council, Australia

The presentation that I will give will be centred around the patient / consumer and how consumers can provide valuable input into the consultation, in particular around their values and circumstances, and why it is important for health practitioners to take them into consideration in a consultation. It will also consider the role consumers should play in a consultation, including informed consent and what that means, what consumers can expect of the health practitioner in a consultation, and what the rights of health consumers are. I will also look at research and what consumers, both at an individual level and community level, need for any research to be successful.
Strategies to Translate Evidence into Education and Practice within Chiropractic Educational Institutions

Christine Goertz, DC, PhD

Palmer University, USA

Chiropractic is the 3rd largest doctoral level healthcare profession in the United States, behind only medicine and dentistry. In the U.S., doctors of chiropractic are licensed in all 50 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands as a primary healthcare professional. Traditionally, the culture of the chiropractic profession has placed great relevance on its history, theories, and traditions, with less focus on research and science-based critical thinking. This position is unsustainable as we move into the evidence-based, comparative effectiveness era of modern day health care reform. A new culture is now evolving, one that respects the profession’s historical roots while also recognizing the need to incorporate evidence-based clinical practice (EBCP), defined as application of the best available evidence gained from the scientific method along with clinical expertise and patient preferences to clinical decision making, as a valued part of chiropractic education.

The focus of this brief talk is to outline an 8 year program currently sponsored by the National Center for Complementary and Alternative Medicine, National Institutes of Health (NCCAM/NIH) in the U.S., and provide a brief overview of how this program has supported one chiropractic educational institution’s efforts to translate evidence into both education and practice. The goal of NCCAM’s effort is to support Complementary and Alternative Medicine (CAM) institutions, including chiropractic colleges, as they incorporate EBCP into the core training curricula. The purpose is to further advance practitioner’s understanding and appreciation of research processes and the scientific literature, and how that information can be incorporated into clinical practice.

Between 2005 and 2007, NCCAM funded 9 CAM educational institutions through the R25 grant mechanism to increase the quality and quantity of research content in their respective curricula. As stipulated by the Program Announcement, each CAM institution partnered with a research-intensive university to develop and implement its program.

Four chiropractic educational institutions were successful in obtaining funding under this program. These include National Health Sciences University (2005), Northwestern Health Sciences University (2007), Western States Chiropractic College (2005), and Palmer College of Chiropractic (2007). All four institutions took slightly different pathways to achieve NCCAM’s general goal as described above.
Palmer’s approach has been to develop a series of strategies based upon the general framework of innovation theory, utilizing a broad train-the-trainer model. Initial specific action steps were directed toward increasing knowledge and using persuasion - identifying cohorts of faculty who are viewed as opinion leaders to serve as innovators and early adopters of EBCP. Faculty in these cohorts translated their EBCP knowledge into education of students through developing new and revising existing courses in EBCP, integrating EBCP competencies into basic and clinical science courses and using EBCP while training clinical interns. Key components to the success of Palmer’s EBCP plan have been the effort extolled by these early adopters, strong interest among students, and the degree to which the executive management team has committed itself to successful implementation of the EBCP program objectives.

We will know this program has been successful when we see adoption of EBCP attitudes, knowledge, and skills by Palmer graduates who are effectively practicing evidence-based clinical decision-making in an environment that increasingly demands interdisciplinary cooperation and an emphasis on patient outcomes. The language, concepts and behaviors used by all healthcare providers who are versed in evidence-based clinical practice is a common denominator that leads to understanding, cooperation, and consensus, all in the patient’s best interest.

Acknowledgment

Supported in part by NIH/NCCAM grant# R25AT003580.
Strategies to Translate Evidence into Education and Practice: Designing Implementation Interventions to Improve Practice

Simon French DC, PhD, MPH, BAppSc(Chiro)

University of Melbourne, Australia

In clinical settings, implementation research is the study of methods to promote the systematic uptake of clinical research findings, and other evidence-based practices, into routine practice to improve the quality of health care. Evidence-based clinical practice guidelines outline best practice for the management of different conditions, yet there is often a mismatch between guideline recommendations and routine practice. To date, the best strategies to support meaningful changes in everyday clinical practice are not known.

Implementation interventions are usually complex interventions designed to change healthcare professional, or organisational, behaviour. They aim to improve and sustain the translation of research evidence into practice. However, there is little systematic guidance about how best to develop these complex interventions, particularly in the chiropractic setting.

In this presentation I will give an overview of implementation research in Australia in a chiropractic setting, and discuss two guideline implementation cluster randomised trials in low back pain. I will also cover some of the challenges and methodological issues of this type of research in this context (for example, using theoretical frameworks to develop interventions; individual behaviour change vs organisational vs sociological; patient level outcomes or process outcomes). I will then discuss how this research could be undertaken in educational settings to improve the quality of teaching and learning.
Utilising a 'General Semantic' Conceptual 'Map' in the Practice of 'Critical Thought in Evidence Based Teaching

Sharyn Eaton DC, PhD

Macquarie University, Sydney, Australia

How do teachers develop a culture of critical thought within which students think and act like researchers? The framework of General Semantics (GS) involves an interdisciplinary, systematic and methodological process for thinking. It involves 'systems integration' influencing how we perceive, construct, evaluate and communicate. Special consideration is given to our language construct which influences perceptions and 'meaning'[1, 2].

Chiropractic students should develop an evidence informed framework that focuses on the clinical, practice experience. In the educational setting this 'evidence informed framework' begins with each student developing a personalised 'map' of that represents the complex interaction of the many information systems [3, 4] which bear upon chiropractic practice. 'Extensional' models or devices are then utilised in a 'hands-on' approach to realise the student's epistemological style [2, 5].

The aim of this paper is to promote the use of the 'territory map' in clinical problem based learning, enhancing integrative thought, critical thinking and evaluation through 'extensional learning'.

The Territory 'Map'

In the context of this study, maps are used to navigate through the complexity of information systems. Mapping is a process of subsuming the scientific facts being investigated into a particular piece of land, or the 'territory', at some point in time. A map is not the territory it represents, but, if correct it has a similar structure to the territory [2, 4].

Mapping incorporates 'outside and inside influences'. Outside influences includes all forms of evidence-informed research from experimental and RCT's to case studies and anecdotal evidence. Inside influences include how 'the person' relates to or integrates the different 'components' of research. Additionally, inside influences include personal beliefs, insights, opinions, assumptions, premises, theories, expectations, preferences and philosophical views [2, 4]. All are drawn on the Map. The student may also include comments from the media relating to any publication that impacts on the territory that is being mapped. Each student should review, reflect and evaluate the Maps as well the maps of others. That is, they must integrate all the information within the Map, reflecting on statements from 'inside concepts' and question the beliefs and assumptions that might lie behind them. Distinguishing facts from inferences is an important skill for students [2].
Students who form their own personalised maps, are encouraged to decide on a 'Map' that fits the territory. To do this, they must compare their own maps with others and look for similarities, patterns and differences. This exercise should facilitate interactive learning. The student is required to make a list of specific questions that can be seen as a 'testing hypothesis' based on the degree of adjustment between our ideas and interventions [2, 4, 6].

For example, in summary, the subluxation complex is mapped according to scientific principles and such an exercise would include documenting not only available scientific evidence but also a collection of data from a common locally symptomatic subluxation in each joint region. In addition to this, anecdotal evidence is included and philosophical views as well as comments from the media are also incorporated within this Map. The technique of 'dating' (described below) is used to reflect the accumulation of knowledge over time.

The process of mapping also utilises extensional as opposed to intentional modes of learning in the development of critical thought and problem solving.

The Extensional Verses Intentional Mode of Learning

Intentionally orientated people tend to show more dependence on the map than on the territory. They function in a world of statements and verbal definitions compelled to defend the chiropractic profession rather than say “I don't know, let's see” [2]. Such students need to understand that to produce optimum map territory congruence we must use facts, figures measurements, descriptions and reports from actual observations that can be verified. As opposed to purely verbal constructs, mapping is a method of Visualisation.

Each generation inherits the accumulated knowledge of the preceding generation and builds on it. This leads to the development of an epistemology and is called 'time binding'. An extensional technique called 'dating' may assist with demonstrating that all things change over time. This involves attracting superscript dates to our evaluations [2].

Other learning techniques or 'rules' utilised in extensional learning in chiropractic education would include the following:

- Students must have a 'non-allness' approach to evaluation. 'Allness' reflects stereotype thinking and over-generalisations. This type of thinking blocks communication and the students are less likely to be able to learn or change their train of thought.[3, 4]
- Non-elementalism. This is based on the construct that the human body is closely integrated and interrelated. For example, mind, body or emotions should not be considered separately when evaluating the 'whole'. The Structural Differential shows that reality is far too complex to be subsumed by a single label.[7]
- Abstracting. This refers to adding characteristics that are not present at previous levels. Unfortunately this exercise may incorporate prejudice or bias which
should be recognised. This can be valuable in searching for new questions that warrant further investigation.[7]

- Structural Differential. This involves abstracting and making inferences on scientific concepts based on relationships and patterns [2].
- Students should refrain from utilising “either”/”or”-ness which encourages them to talk about ideas in polarities. Instead of framing and responding to situations using 2 values of thinking, it can be beneficial to use a multi-valued approach to reflect on the possibility of further choices.

Conclusion
In becoming disciplined participants in the scientific endeavour, students not only develop their individual communicative skills, they also enter into understanding a reflection upon empirical investigations and application of communally developed knowledge to problems of our common life. 'Argument' through discussion has become to be seen as relevant to critical thought in science education. The exercise of territory mapping is a platform for 'argument', debates and discussion utilising critical thought. Specific questions will identify hypotheses that will open avenues for further investigation.

References
Educational Theory in Teaching and Learning of Manual Skills in Chiropractic

John Triano DC

Canadian Memorial Chiropractic College, Canada

Dunphy and Williamson (2004) described four levels of motor skill learning; novice, advanced beginner, proficient, and expert. Studies related to spinal manipulation (SM) training and expertise generally show significant improvement in performance when educational strategies reflect motor learning principles (Descarreaux et al. 2006; Triano 2003 et al.; Triano et al. 2004). Key learning stages and biomechanical parameters characterizing expertise have been identified in longitudinal and cross-sectional studies (Cohen et al. 1995; Descarreaux et al. 2005; Descarreaux and Dugas 2010; Triano et al. 2011). The purpose of this work is to review the underlying constructs and evidence for improving student performance of SM.

Widely accepted in the motor skills and medical education literature (Reznick and MacRae 2006), the work of Fitts and Posner (1967), divided skill learning into three continuous stages; the cognitive, the associative, and the autonomous. How prerequisites are organized prepares the cognitive phase helping the student to intellectualize the task, translate it into motor behaviour, and can significantly influence technique learning (Triano et al 2004). Some teaching methods focus on prescriptive rehearsals (Harvey et al 2011) and extensive choreography of postures and movements. Retention of new skills can be disrupted if too many different learning tasks are presented in a short interval of time (Trempe 2011). Other models systematically sequence tasks into hierarchical blocks of theory, practice and student reflection on performance termed a “mixture-of-experts” model (Krakauer and Mazzoni 2011). Such strategies enhance the development for general rules of skill execution (Wulf et.al. 2010) that build on each successive block. For SM, sequencing was the key difference between two programs where results of performance in the early stages of training (Triano et.al. 2004) were notably different. Where student performance was more advanced, the theory/practice staging sequenced, 1) familiarization with specialized equipment, 2) principles and practice of patient transfer, and 3) theory and intention of SM procedures to be performed.

In the associative phase of skill acquisition, techniques are practiced under supervision. Quantitative feedback, in the form either of knowledge of performance (KP) or knowledge of results (KR), can be compared directly with benchmarks and reduce execution errors. Current evidence suggests that gains in performance from direct KR can be retained (Descarreaux et al. 2006; Triano 2003 et al.; Triano et al. 2004; Cohen et al.1995; Descarreaux et al. 2005; Descarreaux and Dugas 2010; Triano et al. 2011). Adams (1971) proposed that sensorimotor learners contextualize errors in performance by comparing KR with sensory feedback information and coaching related to task trial.
Timely feedback is vital for appropriate learning (Hauser & Bowen 2009), fostering sensorimotor learning through interactive mechanisms that map onto different parts of the central nervous system to anchor neuroplastic changes (Krakauer and Mazzoni 2011) through adaptation, use-dependent plasticity and operant reinforcement. Relevance of feedback and quality of rehearsal are essential since inappropriate motor control may be reinforced with irrelevant feedback and inadequate practice schedule.

KR may take one of a several forms that have been shown to facilitate learning and transfer to “real life” clinical situations (Descarreaux and Dugas 2010). Force sensing technology measures parameters from one or more force/moment components acting on, or passing through, the patient’s body (Herzog 2000). A number of investigators have contributed to definitions for the phases of the force-time profile (Kawchuk and Herzog 1993; Herzog 2000; Triano 2001) of SM procedures. Typically (Downie et.al. 2010), the phases include pre-load, rate of rise, peak force and duration. The preload is a quasi-static force applied over the targeted segment of interest. Its intent is to compress the soft tissue and to move the articulation toward the limit of its range of motion. Rate of rise, sometimes referred to as speed of delivery, is the change in force from the baseline or to the peak amplitude divided by the intervening interval of time. It represents an average rate of force increase. Duration of the procedure defines the interval from the departure from preload to when the fall of peak amplitude returns to the pre-load value. Descriptions for the line of action, or direction, of the force application (Triano et.al. 2011) can be displayed, depending on the configuration of force-sensing technology. Descarreaux et al. (2006) quantified the weight transfer during procedure application. In their work, the time of peak force from operator weight, sensed by standing on a force plate, and the development of peak force sensed at the hand delivering treatment to the patient represented a coordination index (Descarreaux et.al. 2005). The lower the time difference, the higher the level of coordination.

Success in these formative stages of education are prerequisite to student interaction with live patients in teaching clinics where the learner transitions into assuming responsibility for health care delivery. Ideally, there is a smooth transition from associative learning to the autonomous phase. Performance becomes smooth and automatic, forming skill proficiency. Learning proceeds through a natural maturation process in skill parameters that reaches a plateau in force amplitude and speed (Descarreaux et al 2010; Triano et al 2011). When experience yields skills that are able to be successfully applied under unfamiliar or novel circumstances, the expert status is reached. The challenge for chiropractic educators is to develop reliable and predictable formative evaluations that optimize student performance and retention of skills to competency at or before the autonomy of clinic practice.
Selecting Which Evidence to Use in the Long Haul Practice: A View from the Field

Dennis Richards BSc, DC, Grad Cert Phil Studies, FACC, FICC

Private Practice, Australia

The chiropractor in day-to-day practice has many options from which to choose in selecting which evidence from which sources she or he will use in practice.

‘Evidence’ in this paper is taken to mean the integration of clinical expertise (the ability to use learned clinical skills and past experience), patient values (the unique preferences, concerns and expectations of each person), and research evidence (the results of valid and relevant research from basic and clinical research).¹

These options may include the following:

1) Evidence from what he was taught in his pre-professional education. The range, content and quality of such evidence can vary widely between different educational institutions.²

2) Evidence from what she might learn in continuing professional development events,

3) Evidence which might appear in the literature.

4) What seems to make sense?

5) What seems to work?

6) What clients might seek and pay for.

This paper reviews some of the different types of evidence available to the practitioner, and discusses reasons why some may be chosen and used. It also reviews some dental, medical and physiotherapy practitioners’ attitudes to evidence-based guidelines and addresses reasons why practitioners may be less than enthusiastic in adopting evidence-based guidelines.

References


2 Richards DM. Aligning Lifelong Learning and Continuing Professional Development with the Techniques Practised by Chiropractors. Chiropr J Aust 2011;41;95-98.
Extension in Chiropractic Education: A tool in introducing patient values and preferences in the Evidence Based Practice paradigm

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One of the pillars of Evidence Based Practice (EBP) is the patient’s values and preferences. There are several methods to assess value judgments, including the “standard gamble” developed by Von Neumann and Morgenstern to measure values for health. Despite the existence of such methods, integrating patient’s values in EBP is a challenge. A bigger challenge is to include the knowledge of these values and preferences in chiropractic education.

Extension Education is a discipline that can be traced back in the 50’s in Indian educational institutions, though the very concept of Extension Education was first applied by the Cambridge University (U.K.) in 1873. In India, it was introduced as a part of the undergraduate teaching programme in agriculture and it referred to the role of the educational institutions in the community. Currently, the concept of Extension Education and Extension Programmes has grown beyond the agriculture sciences and became a matter of higher education in some countries such as Sweden and Brazil. In Brazil, the Constitution specifically addresses the inextricable connection between Teaching & Learning, Research, and Extension Education in the university system. Extension Education promotes ways of interaction between the university and the community, allowing students to apply the knowledge and technology acquired and becoming agents of social transformation. This interaction generates a new body of knowledge, which can be used as a feedback to the academic programmes of an institution.

Chiropractic education in Spain is something quite recent. The chiropractic programme at the Real Centro Universitario Maria Cristina started in 2007. In structuring the curriculum, the concept of building upon the three pillars of Education, Research, and Extension was proposed and applied.

In order to promote Extension Education, activities such as the outreach mobile chiropractic units providing care in community shelters, orphanages, and international humanitarian trips were structured as part of the curriculum. These activities allow the chiropractic student to move beyond the walls of the university to interact with the local and international community, and bring to the community the results of education and research developed at the RCU.

The Extension Programmes also address some of the competencies established by the RCU, such as interpersonal competencies (teamwork, appreciation of diversity, ethical commitment) and systemic competencies (understanding of cultures and customs,
capacity to adapt to new situations). In being off-campus, the student is challenged in many areas of development, including developing an awareness concerning the local community and the world. There are opportunities to appreciate how members of the community see health and the values they carry on a daily basis. It might just scratch the surface of understanding values and preferences if there is no measurement of the outcomes. At this point, these programmes were introduced into the curriculum without the specific purpose of contributing to the EPB model.

Conclusion:
Therefore, the authors present the Extension Education and Programmes as an important part of a chiropractic programme and as possible channels in developing a first approach to the values and preferences of the society, thus addressing one of the pillars of EBP.

References
Computer-Aided Assessment of Chiropractic Students’ Radiology Interpretation Skills

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Introduction
Assessing students’ practical skills in radiology can be challenging and biased results may occur when procedural problems arise in the course of conducting examinations. For instance, when images of radiographs are projected on a screen while students are seated classroom style, all students do not have an equal opportunity to see what is being projected. Details may therefore be missed and viewing from different angles may lead to unreliable observations. Scores for students who are disadvantaged in this manner may suffer simply because they do not have the same vantage point as the others. OSPE-type examinations are another option, where individual radiographs are viewed on a computer screen or placed on a view-box while the students move from station-to-station, but OSPEs can be difficult to administer, labor intensive and time consuming.

One solution to these types of challenges is to assess groups of students all at the same time in a computer learning laboratory (CL-Lab) where they are asked to view images of radiographs that appear on a computer screen that is placed directly in front of them. In this setting, each student has his or her own computer display, so they all have the same viewing advantage. An examination conducted in this manner would give each student an equal opportunity to view the radiographic images, invigilation would be less demanding and less time would be required to conduct the examination.

Computer-assisted instruction in diagnostic imaging has previously been described in the chiropractic education literature (1), although assessment by means of this technology has not. Therefore, the purpose of this study is to describe the implementation of the assessment of radiological interpretation skills in a CL-Lab setting of a class comprised of 28 fourth semester chiropractic students.

Methods
Fourth semester chiropractic students at our university were assessed on their radiological interpretation skills in a CL-Lab setting as part of their summative end of semester examinations. Each student was assigned a computer that they used throughout the entire examination. That is, the students did not move from computer-to-computer for successive questions. The examination comprised 20 questions which were worth a total of 35 possible marks. Seven of the questions were multi-part short answer type (SAQ) and 13 were multiple choice questions (MCQ). Each question corresponded to a particular radiographic image that was projected independently on each student’s computer monitor.
The software that was used to create the examination is Moodle Quiz Module (2), which was accessed on the university’s Intranet. Each student accessed the examination by logging on to the e-learning portal independently. The students’ results were sent to a virtual repository at the conclusion of the examination, immediately after the student submitted their answers. The submitted MCQs were scored automatically by the software, whereas the SAQs were later manually marked by the course coordinator.

The students had complete control over which images they viewed, as well as the rate that the images were changed on their computer screen. They could freely move back and forth from question to question whenever they wanted and could change answers that were previously selected. The questions appeared on the computer screens in random order. Also, the various components of the questions were randomized, including the MCQ stems.

This was a timed examination spanning 60 minutes. When each student started the examination, a timer counted down from 60 minutes. The students were required to submit their answers prior to the end of the countdown. In fact, they would not be permitted to submit their questions if they went beyond the allocated 60 minutes, though none of them did. The examination was proctored by 2 invigilators, including a chief invigilator who was the course coordinator and a co-invigilator who was assigned by the university’s academic services department. The invigilators walked about the CL-Lab observing the students throughout the examination.

Results
Twenty-eight students were assessed in a 1-hour examination. Descriptive statistics of the students’ scores are shown in the table below.

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<th>Table – Descriptive statistics of students’ scores (%)</th>
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<td>Mean score</td>
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The cut-off score for passing in this university is 50% and an A begins at 75%. Therefore, given the resulting mean and range of scores, the distribution of scores was acceptable and it is thought that the examination adequately discriminated the best and worst students.
Discussion
The examination was considered to have effectively assessed the students’ radiology skills; it was also thought to have been efficiently run. No irregular student behaviours were observed and no technological issues occurred. There were, however, some challenging aspects to the examination that had to be controlled for in order to ensure validity and fairness. The first challenge had to do with the fact that if the students viewed the same questions simultaneously, they could possibly copy answers from each another. This potential problem was controlled for by presenting the questions to each student in random order. Not only were the questions randomly presented, but the multi-part components of the questions were randomized as well, including the MCQ stems.

The conclusion of this case study is that a CL-Lab assessment of radiology interpretation skills was an effective way of determining the knowledge and skills of a group of fourth year chiropractic students. Compared with other forms of assessment, the examination was considered to be fair, yet it was difficult enough to discriminate between the academically stronger versus weaker students.

References
Teaching Ophthamloscopy in Chiropractic Schools – Where is the Evidence?

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Despite regional accreditation standards and the quality assurance role of the CCEI (The Councils on Chiropractic Education International), differences in chiropractic education exist both internationally and nationally. This is not necessarily a major problem, as the role and responsibilities of the chiropractor may vary – not only between countries, but also within them. However, the goal common in all chiropractic educational institutions is to train primary care practitioners that can - at a minimum - function effectively in the community in which they are trained. Ideally, they will also be able to transport their skills to practice in other states and countries, thanks to the reciprocity that is embedded in the CCEI member accrediting agencies.

The philosophies which drive the curriculum at chiropractic schools can also differ, with some aligning themselves as predominantly ‘evidence based’, others as ‘subluxation’ based, and others trying to embrace both. Consequently, the emphasis given to different subjects within a program varies between institutions. Diagnosis is one such subject area.

Many techniques are taught within the diagnostic sciences. One which has initiated much discussion regarding its inclusion in the curriculum is ophthalmoscopy. Why do we teach it? Is there evidence to support its position within the curriculum?

A search of the literature fails to reveal any discussion of this subject in relation to chiropractic education, although the function of ophthalmoscopy in medical school curricula does exist (Benbassat et al 2011, Fan et al 2007).

A search of the accreditation documents of the regional chiropractic accrediting bodies reveals no reference to ophthalmoscopy or fundoscopy, although it is acknowledged that this omission does not infer that it should not be included within chiropractic curricula.

Why target ophthalmoscopy as an issue? Firstly, in order to view the retina fully, the pupil should be pharmacologically dilated (mydriasis). This is not possible in chiropractic practice. In order to get maximum benefit without mydriasis, the examination room must be darkened in order to restrict as much light as possible. Optometrists and ophthalmologists (and even some general practitioners) now use a slit lamp or a retinal camera to view the fundus, which provides a far superior method of examination. Direct ophthalmoscopy is used far less frequently today in the developed world.
The second issue relates to why the chiropractor would wish to view the fundus in the first place. Consider the following scenarios:

1. The patient may have a visual symptom, such as blurred vision, double vision or diminished vision. The chiropractor clearly needs to refer the patient to a medical practitioner or an optometrist for a more in-depth eye examination.
2. Some eye disorders can be diagnosed by cranial nerve testing, where an abnormality in a patient’s visual fields or in visual acuity would highlight the need for referral.
3. A patient is known to be diabetic or hypersensitive, and is under the care of a medical practitioner. The degree of retinopathy thus needs to be regularly monitored. This is, however, usually conducted on a regular basis by an optometrist or ophthalmologist.
4. The patient has a family history of glaucoma. Although ophthalmoscopy is appropriate for the detection of normal pressure glaucoma, tonometry (conducted by either the optometrist or ophthalmologist), is the most appropriate diagnostic tool for high pressure glaucoma.
5. The chiropractor suspects an acute disorder such as a retinal detachment, acute angle closure glaucoma or vascular occlusion. Regardless of ophthalmological evidence, a suspicion of such a problem necessitates immediate medical referral.
6. If a patient presents with a neurological symptom and/or sign, ophthalmoscopic examination would be appropriate. However, the absence of any deviation from normal with this examination should NOT eliminate the need to refer the patient to the appropriate medical practitioner. Primary care practitioners – whether medical or chiropractic - are trained to make their clinical judgements based on consideration of all available information. When the clinical picture suggests ‘X’, and the chiropractor believes referral the best option, the absence of a single expected symptom or sign should not alter this decision.
7. The most likely scenario within chiropractic practice which may suggest the need for ophthalmoscopy is a headache for which no demonstrable cause can be determined. In this situation, it is a useful tool. Any suspicion of increased intracranial pressure requires the practitioner to check for papilloedema. If observed, urgent referral is required. However, a practitioner who is concerned that there may be raised intracranial pressure would be negligent if he or she did not refer, regardless of the presence or absence of this sign.

So why do we teach ophthalmoscopy? One may suggest that a routine ophthalmoscopic examination may reveal papilloedema, even in the absence of headache or any neurological or visual symptomatology. This, of course, is possible. However, how many chiropractors would examine the fundus in the absence of such symptoms? A medical practitioner certainly would not, unless the reason for the consultation was a complete medical assessment.
Some individuals will only use a chiropractor as their primary health care provider, rejecting any association with medical practitioners. It is argued by these chiropractors, that there is a need for them to have the broadest possible range of diagnostic skills, hence the importance of this type of training being included in the chiropractic curriculum.

If ophthalmoscopy continues to be taught in chiropractic schools, a clear rationale for its use needs to be articulated by academics, accrediting bodies and the profession. Students, after all, really learn best when they understand the relevance of what they are being taught.

A discussion on the role of ophthalmoscopy in chiropractic schools, and the evidence to support its inclusion would go a long way to clarifying its role within chiropractic practice.

References

Identifying Barriers and Enablers to the Uptake of Evidence-Based Guidelines for Acute Low-Back Pain by Australian Chiropractors: A Qualitative Study Using a Theoretical Framework

Denise O’Connor, Simon French, Bruce Walker, Jeremy Grimshaw, Susan Michie, Jill Francis, and Sally Green on behalf of the ALIGN (Acute Low-back pain Implementing Guidelines iNto practice) study group

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Background
Acute low-back pain (LBP) is common and chiropractors provide much of the care for this problem in Australia. The release of an evidence-based clinical practice guideline by the Australian National Health and Medical Research Council has provided recommendations with the potential to improve the quality and safety of care for people with acute LBP. However, dissemination alone of this clinical practice guideline will not change health professional behaviour. The ALIGN project (Acute Low-back pain Implementing Guidelines into practice) aims to test the effectiveness and cost effectiveness of a targeted, theory-based implementation strategy to increase the uptake of this guideline in physiotherapy and chiropractic practice [1]. Our approach uses behavioural theory and empirical literature to develop implementation interventions designed to change health professional behaviour. The aim of this presentation is to present the chiropractic results of the qualitative phase of the ALIGN project.

Methods
Semi-structured qualitative interviews guided by the Theoretical Domains Framework [2] were conducted with chiropractors in Victoria, Australia. Participants responded to questions about their management of patients with acute non-specific LBP and factors influencing their behaviour including the reasons (theoretical domains) for adherence or non-adherence to the guideline. Thematic and content analysis identified primary themes in the data.

Results
Interviews with 24 chiropractors were conducted. Multiple barriers to implementing the key recommendations of the guideline were identified. Key themes relating to the guideline recommendation concerning x-ray identified barriers in the theoretical domains such as: beliefs about capabilities (to negotiate with patients and resist pressure for x-ray); beliefs about consequences (negative consequences of not taking an x-ray, e.g. lose patient to another provider, cause harm if spine manipulated without prior x-ray; positive consequences of x-ray identified e.g. x-ray reassures anxious patient); environmental context and resources (x-ray easily accessible, first-line diagnostic tool); social influences (perceived expectation/pressure for x-ray from patients); emotion (fear of missing underlying sinister pathology and litigation for
misdiagnosis); beliefs about professional role (responsibility to diagnose and treat accurately; perceived negligent if don’t x-ray); and knowledge (about diagnostic utility of x-rays and radiation exposure delivered).

Conclusions
We identified multiple modifiable barriers and enablers to implementing the acute LBP guideline in chiropractic practice. A theoretical framework for behaviour change is useful for exploring the reasons for evidence-practice gaps and to inform the design of implementation interventions. These qualitative data were used to develop an implementation strategy to address the identified, modifiable barriers, and is based on contemporary theories, and available evidence, for behaviour change.

References
Assessment of Competence in Evidence-Based Practice: Controversies and Challenges

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National Board of Chiropractic Education, USA

Basing treatment and health management recommendations on the best currently-available scientific evidence makes sense to consumers, educators, and regulators of health care professions. The process of evidence-based practice (EBP) has been defined as: “the integration of the best research evidence with patients’ values and clinical circumstances in clinical decision-making” (Haynes, Devereaux, & Guyatt, 2002). These procedures are now being taught in many healthcare training programs, and some regulators are now requiring competence in EBP for healthcare providers (e.g., General Chiropractic Council, 2009, SOP 3.2). To what degree can EBP competence be assessed as part of a high-stakes, pass-fail examination for registration/licensure? And, if it can be reasonably assessed, why are many examining boards not currently doing it?

International consensus has emerged in the past decade that there are five key steps (competencies) in the practice of evidence-based health care: Ask, Acquire, Appraise, Apply, and Assess (Sackett, Strauss, Richardson, & Rosenberg, 2000) (Dawes, et al., 2005). Each step requires specific knowledge components and skill sets:

Step 1 - Ask consists of converting a clinical scenario into a structured, answerable question. Knowledge and skillful use of the question construction process known as PICO (Patient, Intervention, Comparison, Outcome) have been identified as major components of this first step.

Step 2 - Acquire necessitates a search of the literature to identify the best available evidence to answer the question. Knowledge of the most appropriate scientific databases and search skills in acquiring evidence from a variety of sources allow a practitioner to gather necessary information.

Step 3 - Appraise reviews the evidence for its validity and applicability to the patient and condition at hand. Knowledge and critical appraisal skills from epidemiology and biostatistics allow the provider to sift the information retrieved and identify the research studies and scientific reviews that best answer the clinical question.

Step 4 - Apply consists of integrating the results of the literature appraisal into clinical practice. A broad knowledge of communication and practice techniques are required, along with the skills to relate scientific information appropriately to patients.
Step 5 - Assess requires practitioners to reflect and evaluate the EBP process and its impact on their care of patients. Knowledge of self-review and assessment techniques and skilful focus on the entire process of patient-centered, evidence-informed care are necessary for this step.

Methods and tools for assessing competence in EBP are still in early development. Several written assessment tools have been proposed and studied (e.g.: Berlin, Fresno, K-REC, KACE instruments), but are not appropriate for high-stakes testing due to various limitations (Shaneyfelt, et al., 2006) (Ilic, 2009).

The knowledge required for the first three steps of EBP (Ask, Acquire & Appraise) can probably be efficiently assessed during a written summative test, as some studies have demonstrated. The knowledge necessary for competence in the fourth and fifth steps (Apply EBP to patients, Assess the impact of EBP on patient care) may be able to be tested in a written summative evaluation, but less research has addressed the use of written tests for these steps.

Some of the important skills necessary for Ask and Appraise (Steps 1 and 3) can be evaluated in a written test, while the significant skills necessary for Acquiring and Applying EBP (Steps 2 and 4) can only be assessed by performance tests. Demonstration of the skills required in the final step of the EBP process (Assess the impact of EBP on patient care) must be part of an audit of actual practice, using tools such as practice diaries and self-reports. Therefore, competence in the skills of Step 5 cannot be accurately assessed in a summative examination. Figure 1 is an overview of methods for the assessment of EBP competence.

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Figure 1

Competence in Evidence-Based Practice is not currently being assessed during most examinations for chiropractic registration/licensure for two significant reasons. One is the wide variation in the teaching of the knowledge and skills of EBP among chiropractic training programs. A few schools have plunged in deeply, with the help of grants and externally-trained faculty. Others have been slower to change their teaching processes and to insert additional content into their curricula. In the U.S., the National Board of Chiropractic Examiners must base its Parts I and II examinations on the curricula of North American doctor of chiropractic training programs; testing EBP knowledge and
skills could unfairly favor students at some schools and disadvantage others. An additional related concern is that textbooks commonly used in chiropractic programs contain little content regarding EBP and the necessary knowledge and skills. Referencing test items covering EBP would, therefore, require the use of journal citations, which is less acceptable for high-stakes examinations.

The other major reason competence in EBP is not currently assessed in NBCE examinations is its lack of use among practicing chiropractors in the U.S. A 24-member advisory committee was convened in 2008 to inform the development of the NBCE’s most recent occupational analysis of the chiropractic profession. The committee consisted of 16 practicing chiropractors and 8 experienced chiropractors who were serving as educators and test developers. After extensive deliberation, this group did not list evidence-based practice knowledge and skills among the critical tasks or essential skills for safe and effective chiropractic practice. More recently, a qualitative study from the U.K. reported that a sample of chiropractic practitioners do not regularly use EBP methods in their daily practices, in part because they find that most research studies are not clinically relevant (Hall, 2011).

The concepts of EBP are relatively new to many components of the chiropractic profession, and their adoption into practice is still at an early stage. As awareness and training of EBP grows, and as the technology and research for its effective use in practice improves, demonstration of knowledge and skills in EBP will likely be considered for requirement by the regulatory/licensing boards of all healthcare practitioners.

References


A Systematic Review of Complementary and Alternative Medicine (CAM) for the Treatment of Headache

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Abstract

Introduction: Headache is a common but complex, multifaceted problem. There are many treatments for headache, which include non-pharmacological options such as complementary and alternative medicine (CAM). Alternative treatments (such as CAM) for patients with pharmaceutical intolerance or preference for non-pharmacological treatments are an important area for research. However, the effectiveness of CAM in headache management in comparison to other treatment is controversial.

Method: A systematic review of the most common CAM therapies (acupuncture, massage and chiropractic) was conducted from 1991 to 2011. The systematic review identified all randomized clinical trials (RCT) on CAM therapies for headache from CINAHL, Medline, PEDro and PubMed databases. Keywords used were headache, migraine, CAM, chiropractic, spinal manipulative therapy, acupuncture, massage, and osteopathic treatment.

Results: Twenty three RCT were identified and reviewed for methodological scores using the modified van Tulder system and Cochrane system. Methodological scores ranged from poor to good with most limitations due to sample size, poor description of the randomization procedure and a lack of blinded outcome measures. This study suggests that CAM therapy (especially spinal manipulative therapy) appears effective in the management of headache and migraine. One RCT reported a mean reduction of migraine frequency, intensity and duration from baseline to follow-up were 42%, 13%, 36% in a chiropractic group versus 17%, 5%, and 21% in the control group. In comparison, Brandes reported patients treated with topiramate (50 mg/d, 100 mg/d and 200 mg/d), had a response rate of 39%, 49% and 47% (respectively) compared with the placebo rate of 23%. Sumatriptan-naproxen gave pain relief for 24 hour period in 25% of patients versus 8% in placebo patients. Pain intensity was reduced 71% in the massage group and unchanged in the control group. However, variations in study methodology make direct comparison less conclusive.

Conclusion:

Further research on CAM therapy in the management of headache and migraine is necessary, but a systematic review of available literature suggests that CAM therapies are appropriate treatments for headache and migraine.

Key Indexing Terms (MeSH): Chiropractic, massage, acupuncture, CAM, headache, migraine.
The Introduction of Flexible Pressure Pad Technology in the Learning and Teaching of Manipulative Skills: A Pilot Study to Determine Utility

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Introduction
Manipulative skills training forms a central part of undergraduate chiropractic education and the educational task of teaching chiropractic manipulative skills to novice students is considerable. Students begin to learn various manual/manipulative skills early in the programme via a staged integrative approach in order to develop the required competencies in a relatively short period of time. These manual skills are also assessed at various learning levels throughout the programme to ensure acquisition to progress to the next level. Nonetheless, despite the fact that manipulative skills training forms a large part of educational curricula, very little research has been conducted in this area and there are only a few methods that have been developed to quantitatively measure manual skills performed by chiropractors and chiropractic students (Descarreaux et al., 2005; Harvey et al., 2011; Herzog et al., 1993; Triano et al., 2003). It could be argued that quantitative analysis may have an important role in the assessment strategy during the learning of these manual skills at the undergraduate level as well as ensuring competency retention at the postgraduate level in order that practitioners remain fit to practice.

It is an accepted fact that chiropractic manipulative procedures consist of many complex motor skills that require high levels of sensory and motor coordination to reach a level of proficiency (Byfield and Gleberzon, 2012). Presently, very little is known about the way in which skills should be presented to chiropractic students to enhance their acquisition and mastery (Humphreys, 2012). To date, methods to assess acquisition of these skills are, for the most part, qualitatively based primarily relating to competencies associated with the overall manual procedure consisting of, for example, patient positioning, doctor posture, hand contact, weight distribution, weight transfer, balance, breathing sequence and development of pre-load. These bimanual tasks are important aspects of the overall manual skill to ensure efficient practitioner positioning, movement and weight distribution to apply an appropriate amount of force and depth of thrust associated with a high velocity thrust.

Notwithstanding, in order to deliver safe and effective manipulation, chiropractors must also be able to precisely control and execute a number of biomechanical parameters associated with the various forces involved in high velocity manipulation, such as speed of force application, preload, peak force production, time to peak force and duration of peak force at the patient – practitioner interface following a sequence of steps to prepare both the patient and practitioner (Descarreaux and Dugas, 2010). To the best of my knowledge, very little attention is assigned to the competencies associated with the applied forces and other biomechanical parameters associated with manipulative skill teaching and learning at the practitioner – patient interface. There are many
factors that may have contributed to this position, but it is the author’s view that this may be due to the lack of a versatile measurement system that can accurately record these biomechanical parameters delivered in a real clinical setting. This system must also be capable of providing feedback as students progress through the programme and, in addition, include benchmark thresholds for force and speed during various procedures to compare student improvement depending on the level of learning. Benchmark force/time thresholds have yet to be fully established, however, researchers have previously identified some force parameters for various areas of the spine (Herzog et al., 1993). There is some evidence that this approach is being applied to the educational environment and tested to determine utility and whether better learning outcomes are established (Descarreaux and Dugas, 2005; Descarreaux et al., 2006; Descarreaux and Dugas, 2010; Harvey et al., 2011). Research investigating learning and retention of various psychomotor skills related to chiropractic manipulation suggests that the process is enhanced when the context of the learning is known (ie clinical setting), which includes both visual and verbal feedback (ie knowledge of results (KR) and knowledge of performance (KP)) (Humphreys, 2012). Students appear to acquire and retain complex motor skills if they have a better idea of what, when, how and where the skills are applied. The integration of motor skills with appropriate cognitive skills seems to fit this approach particularly in conjunction with the concept of clinical framing (Humphreys, 2012).

Therefore, the aim of this pilot study was to test the utility of a flexible pressure sensor mapping system with related software to measure and record key manipulative psychomotor skills (force and time) commonly introduced in undergraduate chiropractic degree programmes. This high pressure sensor flexible mat technology (Xsensor system- High resolution X3 Pro Package Pressure mapping systems, Xsensor Technology Corporation, Canada), used in this investigation has a pressure range of 1 – 80 psi and a sensor array of 64 x 64 = 4,096 individual sensing elements in a 40 cm x 40 cm pressure field. The software has an optional second calibration pressure range of 10 to 200 psi providing the ability to measure a wide range of manipulative procedures for all areas of the spine and equivalent to published values to date (Herzog et al., 1993). The system is capable of measuring various biomechanical parameters in different measurement units such as, average pressure, peak pressure and contact area and is capable of running two or more sensor pads of the same or alternative specification at the same time. The system is adaptable enough to measure various manipulative parameters at the patient – practitioner interface as well as simultaneously recording full body forces generated by the practitioner. Part of this initial study will be to test the use of the pressure pad directly on subjects in various postures providing a real clinical setting to determine how this may impact on psychomotor skill delivery.

This presentation will report the initial results from a number of projects designed to assess the utility of this equipment to quantitatively measure a number of manual psychomotor skills to enhance student learning and confidence in an educational setting.
References


Enhanced Learning of Manipulation Techniques Using Force-Sensing Table Technology (FSTT): Student vs Supervisor Perceptions of Skill Competence

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Introduction
Spinal manipulation involves skilled neuromotor control that students must learn to administer safely and effectively. Development of skill has relied heavily on evaluation of learner’s progress largely through subjective, observational aptitude of tutors without quantitative feedback. This project uses formative and summative evaluations by supplanting qualitative assessment with quantitative knowledge of results (KR) through force-sensing table technology (FSTT) and immediate student feedback. This preliminary report quantifies the perception of student interns, who have not used quantitative assessment, contrasted with that of their clinical supervisors as a baseline for post-intervention comparisons.

Methods
Fourth year students (n=160), and 23 supervisors were surveyed, and subgroups provided open ended comments, regarding student skills. Each group completed a 100 mm visual analogue scale (VAS) reporting perception of student a) competence and b) confidence upon starting clinical internship. Open ended commentary was evaluated by centering resonance text analysis (Crawdad ™ ). VAS scores (%) were compared by unpaired t-test.

Results
Supervisor confidence in student skills was significantly lower (45.21%, s.d. = 12.85) than student ratings (64.72%, s.d= 16.01) with p=0.00. Rating of competence by supervisors was lower (50.35%, s.d.=17.14), while student ratings were higher (67.36%, s.d.=13.96) by a similar margin (p=0.00). Centering resonance found themes of “technique” and “technique time” with influence scores of 0.26 and 0.16 respectively. Supervisors’ text analysis revealed “SMT” (spinal manipulative therapy) followed by “SMT technique” (0.38 & 0.12, respectively) as influential. The language network context for students was retrospectively focused toward undergraduate learning while supervisors were oriented toward patient care.

Conclusions
Textual analysis and ratings of student skill and confidence in performing manual treatments significantly differ between interns and supervisors. The disparity in focus may reflect the instructional focus on choreography of technique versus the sought-after therapeutic components. Based on the intent of curriculum to achieve a smooth transition from “learner” to “apprentice” in delivery of care through entering internship, the development of learning objectives that focus on that transition may be useful for
enhancing quality of the patient experience in teaching clinics. These data provide a sound foundation to assess the effect of educational intervention.

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Translational Research – From Bedside to Bench and Back

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Research that translates evidence into practice is known as translational research. The name describes two types of research: bench-to-bedside and bedside-to-bench [1]. The term ‘bench-to-bedside’ refers to research that harnesses basic science knowledge to produce new treatment options for patients. The aim of this research is to ensure that new treatments and research knowledge actually reach the patients for whom they are intended [2], with the end point being the production of a promising new treatment that can be used clinically [3].

The term ‘bedside-to-bench’ refers to research that carries results in the opposite direction i.e. unexpected results from clinical trials that are used to generate new hypotheses which direct future research [4].

Encouraging ‘bedside-to-bench’ research can be considered the more realistic approach since our understanding of human disease is still limited and models developed on animals have shown a discouraging tendency to fail when applied to humans [5]. However, this type of research comes with its own challenges such as securing support for areas of research that may not have been previously supported [4].

The disconnect between these two types of research is a relatively recent phenomenon. In the early part of the 20th century, most biomedical researchers were clinicians, creating a strong link between basic science and clinical research [6]. As biomedical research became a field in its own right in the latter half of the 20th century, clinical and basic science research began to diverge [7, 8]. The link between ‘bench-to-bedside’ and ‘bedside-to-bench’ research became fragile, with more funding being directed towards ‘bench-to-bedside’ experiments that were more likely to yield fundamental discoveries, even if they had no prospect of producing something that helped human disease [8, 9].

The challenge facing translational research today is to find a balance between the two, where emphasis is placed on the ability of each to improve health [2]. Recent studies in the field of manual therapy that arose out of preliminary evidence reported in the literature [10-12], are examples of the importance of maintaining the link between the two types of research.

Results from two trials that investigated the effect of administering manual therapy to people with chronic obstructive pulmonary disease (COPD) have shown that complex manual therapy (soft tissue therapy and spinal manipulation) is capable of producing additional improvements in lung function when combined with other interventions such
as exercise [13, 14]. What was surprising in these results was that the improvements in lung function continued to increase after manual therapy intervention had ceased.

A slowing in the rate of loss in lung function over time is not typically seen in people with COPD. Two further studies have been designed based on these results. The first will investigate the effect of administering manual therapy to people with a milder form of COPD i.e. at an earlier stage in the disease process. The second will investigate further the mechanism underlying how these improvements are achieved, focusing on the variation in chest wall rigidity that exists in people with COPD.

If results from the first study confirm the findings from the previous two trials, then manual therapy could be considered as having a preventative element with respect to COPD, and calls for its routine use in managing the disease would have some validity. Results from the second study could improve the efficacy of manual therapy by increasing the accuracy by which it is applied.

This two-way approach to translational research, where bedside-to-bench research informs the design of bench-to-bedside research which then is used to improve patient outcomes, is an example of the importance of maintaining the link between the two and highlights the contribution each can play to improving health outcomes.

Translating evidence into practice in this way, where the original source of knowledge comes from the results of clinical practice, is the basis of much of the research currently being undertaken by the chiropractic profession. It is a good example of how combining information from both approaches can improve the quality of the research. However, in the case of investigating the use of manual therapy in the management of COPD, the potential impact on the utilisation of the intervention, as well as the effect this may have on the scope of practice of practitioners who are licensed to use it, have not yet been fully appreciated.

There is a possibility that translational evidence, like the type described above, could result in a considerable increase in the demand for practitioners trained in the use of manual therapy within the field of chronic respiratory disease. This would bring with it a new type of challenge, one that the chiropractic profession has not yet had to contend with.

References
Evidence-Based Practice Implementation: Getting Faculty to Sing from the Same Songbook

Background Paper (1)
Simon Towler DC
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Up skilling academics and clinicians to teach using an EBP model. Journal clubs and tips for teaching EBP in a chiropractic curriculum.

The reading for delegates attending this workshop is an extract from “Evidence–based Medicine” by Straus et al (4th Edition). The extract has been chosen as it provides contemporary opinion on the subject matter and provides a lead on how to engage staff on the EBP journey. This includes how to conduct an EBP journal club that staff actually enjoy! In addition there are extra sections in the extract that focus on introducing EBP into the curriculum and also teaching EBP. The extra sections beg the question “How do we get staff and clinical teachers to engage?” As part of the workshop we will pose a few questions to the audience about the reading and our topic:

1. Will the journal club as set out in the reading assist in introducing a stronger EBP focus for staff? Is it the correct model?
2. How can we implement the suggestions in the extract on introducing EBP into the curriculum and teaching students? In particular how can we involve staff in this process other than a journal club?
Internal and External Influences on Chiropractic Students: The Good, the Bad and The Ugly

Background Paper (1)
Mike Wiles DC
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Eric Russell DC
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Attitudes toward vaccination: a survey of Canadian chiropractic students
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Abstract

Background: Although the Canadian Chiropractic Association and the Canadian Memorial Chiropractic College (CMCC) endorse vaccination, the prevalence of anti-vaccination attitudes among Canadian chiropractors is unknown. This study describes the prevalence of anti-vaccination attitudes among Canadian chiropractic students.

Methods: An 11-item questionnaire about attitudes toward vaccination was distributed to students enrolled at CMCC during the 1999/2000 academic year. The responses for the 11 items were then summed to arrive at a total score ranging from 0 (most negative attitude toward vaccination) to 22 (most positive attitude toward vaccination). Respondents’ perceptions of sources of vaccine information were also investigated.

Results: Over 75% of the students (467 of 621) completed the questionnaire. Most students (53.3%) reported that in general they agreed with vaccination. This was especially true among first-year students (60.7%). However, among fourth year students, only 39.5% agreed with vaccination. The proportion of respondents who stated that they were against vaccination in general was 5 (4.5%) of 112 first-year students, 10 (8.3%) of 121 second-year students, 16 (13.9%) of 115 third-year students and 35 (29.4%) of 119 fourth-year students. The mean scores on the questionnaire were progressively lower with each higher year of study at the College. The mean survey scores for each year of study were first year, 15.9 (95% confidence interval [CI] 15.2–16.6); second year, 16.1 (95% CI 15.3–17.0); third year, 14.5 (95% CI 13.5–15.4); and fourth year, 12.8 (95% CI 11.7–13.9). The mean scores varied among year of study and were statistically significant using one-way ANOVA ($p < 0.0001$). Among students who relied primarily on informal sources of vaccine information, such as the chiropractic literature and informal talks at CMCC, anti-vaccination attitudes were more prevalent in later years.
Interpretation: Most CMCC students reported pro-vaccination attitudes, but there appeared to be an increase in anti-vaccination attitudes as students progressed through the CMCC program. This pattern was seen almost exclusively among students who relied primarily on informal sources of vaccine information rather than on core CMCC lectures or prior lectures at university.
Internal and External Influences on Chiropractic Students: The Good, the Bad and the Ugly

Background Paper (2)
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International Web Survey of Chiropractic Students about Evidence-Based Practice: A Pilot Study

RyunosukeBarzai, DustinCDerby, CynthiaRLong, MariaAHondras

Abstract

Background: Positive attitude toward evidence-based practice (EBP) principles in healthcare education may be one of the first steps for motivating a healthcare professional student to later apply EBP principles in clinical decision-making. The objectives for this project were to pilot an international web-based survey of chiropractic students and to describe student attitudes, behaviors, and knowledge about EBP principles.

Methods: We used SurveyMonkey™ to develop our survey based on an existing questionnaire used to measure basic knowledge, skills and beliefs about EBP among allied healthcare professionals and CAM practitioners. We invited 26 chiropractic educational institutions teaching in English and accredited by official organizations to participate. Academic officials and registrars at participating institutions forwarded an invitation email and two reminders to students between July and September 2010. The invitation contained a link to the 38-item web-based questionnaire. Descriptive statistics were performed for analysis.

Results: Fourteen institutions from Australia, Canada, US, Denmark and New Zealand participated. Among an estimated 7,142 student recipients of invitation letters, 674 participated in the survey for an estimated response rate of 9.4%. Most respondents reported having access to medical/healthcare literature through the internet, but only 11% read literature every week and 21% did not read literature at all. Respondents generally agreed that the use of research evidence in chiropractic was important. Although 76% of respondents found it easy to understand research evidence and 81% had some level of confidence assessing the general worth of research articles, 71% felt they needed more training in EBP to be able to apply evidence in chiropractic care. Respondents without previous training in research methods had lower confidence in assessing published papers. While more than 60% marked the correct answer for two knowledge items, the mean number of correct answers to the five knowledge questions was 1.3 (SD 0.9).

Conclusions: Although it is feasible to conduct an international web survey of chiropractic students, significant stakeholder participation is important to improve response rates. Students had relatively positive attitudes toward EBP. However, participants felt they needed more training in EBP and based on the knowledge questions they may need further training about basic research concepts.
**EBCP and Chiropractic Education**

**Background Paper (1)**

**John Stites DC**

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**Introduction**

Every healthcare profession exists for a single reason: the benefit of patients. We provide care to improve the health status of those who seek our help. Patient-centeredness should be at the heart of our professional practice and our educational strategies. (1) Yet in the course of the educational process our students often shift their focus and become more doctor or disease-centered. This is true across all healthcare disciplines. Medical students focus on diseases and medications; surgical residents focus on surgical procedures. (2) Chiropractic students are no different, focusing on diseases, subluxations, and techniques. It appears that when competence is gained there is a shift back to a more patient-centered approach. (3)

As educators we recognize the value of this shifting focus. Our students must develop content knowledge and technical expertise. The challenge arises when our learners fixate on a focus, such as a technique, and fail to recognize the gaps in their development to become an effective doctor.

Defining the attributes of an effective doctor is in essence defining the goals of clinical education. These include a foundational knowledge base, diagnostic acumen, patient management skills, technical skills, the ability to effectively communicate, and the propensity to contribute to the profession. Developing these skills and attributes is important, but without the ability to adapt and continually update, these skills erode. (4)

As educators, we face the challenges of not only passing along knowledge but instilling the values of continued lifelong learning. Our graduates need the ability to adapt to changes in the knowledge base and update their practices with new evidence to be flexible as societal needs change. (5)

In addition to instilling the value for lifelong learning, we may need to provide a process. This process should recognize that students have shifting foci and honor the competence they earn through diligent study of a subject or skill. It is essential that this process embrace the patient-centered approach to practice. Evidence-based clinical practice (EBCP) can be that process.

EBCP is the conscientious use of the best available evidence combined with the practitioner’s experience and patient values in making clinical decisions. (6) This paper will discuss the process of EBCP and relate it to the didactic objectives of clinical education and lifelong learning.
EBCP as a process

A doctor is presented with a clinical dilemma. Before electing a course of action the doctor looks at the literature and selects a paper that addresses the concern. The validity of the manuscript is evaluated and based on that information a course of care is instituted and the patient response is monitored.

This illustrates the basic EBCP process. EBCP always starts and ends with the patient. A patient presentation generates a clinical question. The clinical question is asked and a search is performed to acquire an appropriate information source. The information is appraised and then applied to the patient. The patient is assessed for response.

This ask, acquire, appraise, apply, assess process can be used in a variety of clinical and non-clinical situations.(7) There are skills associated with each step and these skills match with many goals of clinical education.

Ask
In an educational environment efforts are made to foster a sense of curiosity. To delve into any concept requires systematic inquiry. To do this effectively the questions posed need to be precise and answerable. Creating an answerable clinical question is a skill requiring clarity of thought, systematic organization and an understanding of potential resources. To organize clinical questions, a PICO format is frequently used. The PICO mnemonic stands for “Patient, Intervention, Comparison, and Outcome.” This format aids practitioners in organizing their clinical question in a way that optimizes the potential of identifying a useful resource. (8) An understanding of different databases is helpful in selecting terms to ensure that the best evidence is acquired.

Acquire
In an environment where information is being generated at an unprecedented rate effective means of obtaining up-to-date, relevant and high quality evidence is necessary. It requires an understanding of the hierarchy of evidence and the research designs used to answer different clinical questions. A question regarding therapy would ideally be answered by a systematic review or a randomized controlled trial whereas a question of prognosis or harm is generally answered by a cohort or case control study.

Effective searching strategies are essential to making EBCP practical in a practice environment.

Appraise
Assessing the validity of a published paper is often challenging. Knowledge of study design and an understanding of the concept of bias are basic to evaluating research. These skills can be improved with mentored guidance. (9) That said, true critical appraisal skills parallel critical thinking skills. Recognizing that no study is faultless, the ability to weigh the merits and shortcomings of a study in order to gauge the level of confidence in the estimate of effect directly reflects critical thinking.
Apply
To effectively apply the results of a study to a clinical situation is the essence of translating research into practice. To interpret outcomes and competently relate them to a specific clinical scenario requires some foundational epidemiological understanding. (10) More importantly it requires a detailed understanding of the patient.

Assess
When a clinical course of action is taken the next step is to assess the patient and gauge the response. This is the critical step since the whole purpose of EBCP is to improve patient care.

Discussion
A significant majority of participants in a recent international survey of chiropractic students agreed with the statement that research evidence is an important factor in chiropractic care. (11) Evidence-Based Clinical Practice is a process that lends clarity of thought to patient management and provides a framework for continued learning and growth for our students. The necessity of incorporating patient values and clinician experience are fundamental precepts of EBCP. (12) EBCP is a patient-centered process that can foster lifelong learning in our graduates.

References

Evidence Based Chiropractic: Presenting it in a Positive Approach

Background Paper (2)

Chris Yelverton DC

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Introduction
Evidence based medicine or practice has been discussed for many years, with greater discussion in the late 1990’s. Since then, different approaches have been presented, where the original concept, which focused predominantly on research as evidence, evolved to include all aspects of practice. This has allowed for an overall approach, with practical applications for improving the quality of health care delivered by practitioners. With an increased focus in all health care professions on adopting evidence based approaches, chiropractic in many countries has had to incorporate this paradigm, specifically within educational programmes, where pressure exists to ensure that this model is utilised in selecting materials to be included in curriculum. Due to historic reasons, or misperceptions of what evidence based approaches include, some resistance within the profession has occurred, and a negativity to evidence based chiropractic has developed.

Within educational institutions, a balance need to be created, and as the profession develops and the need to utilise evidence based chiropractic becomes more important, institutions need to develop strategies within programmes to present this model in an approach that is accepted by students, and allows for utilisation by graduates within the context of practice.

Evidence Based Chiropractic
Numerous texts exist related to evidence based practice, and the purpose of this article is not to re-create these texts. A brief summary of relevant information follows.

Evidence based practice is a method of allowing for lifelong learning, best possible care for patients and continuous improvement of clinical practice. Sacket et al presented 5 steps in utilising evidence based practice. These steps move from asking the question, to finding the evidence, to evaluating the evidence, to applying information (with clinical experience and patient values) to evaluating the outcome. This process can then create a cycle where the last step, is the first step of the continued cycle. This is demonstrated in figure 1. This approach allows for continuous improvement as a quality assurance mechanism.
Figure 1. The 5 steps of Evidence Based Practice
An important aspect of the evidence based practice model, is the definitions proposed for best evidence, patient values and clinical experience. For true evidence based practice to be utilised, all 3 of these must be utilised. This is demonstrated in figure 2 below.

Figure 2: 3 Aspects of Evidence Based Practice
Barriers to Acceptance

Many practitioners are opposed to the evidence based model being utilised in chiropractic. This is often based on misconceptions that this means research based. While this is still an important component of the model, as has been discussed, it incorporates many aspects that allow for integration of research, clinical reasoning and, to a degree, philosophy of chiropractic. In real terms, this system ensures that all aspects are considered, and bias from either direction can be mitigated. This also requires that clinicians and the profession need to conduct research to allow for a balanced approach, with strength based on the entire model, and not isolated components.

Another barrier for some practitioners, is the perception that acceptance of this model somehow means that we will lose our identity as chiropractors. The model design shows that the identity and chiropractic approach, are fundamental to the entire process, and as such, dictate almost all aspects within the gambit of the evidence based model. What is possibly required is the emphasis on evidence based chiropractic, which utilises the process, but with emphasis on the specific chiropractic approach.

Evidence based practice is also not accepted by practitioners with a primary financial focus, or a cook book based approach to chiropractic. The focus needs to be on critical thinking with the best patient interest in mind. While this does mean a prescriptive approach in some parameters (such as history taking and examination) it does not disregard the specific requirements for individual patient presentations.

Risks of Not Following Evidence Based Chiropractic

Internationally, complimentary and alternative medicine (CAM) is under constant pressure from members of the public or organisations that, for whatever motivation, are trying to stop education and training, and even the practice of some CAM therapies. This has recently been very evident in countries such as Australia, UK and Korea. While chiropractic is not always linked or bundled together with CAM therapies, the basis of many of these motivations against these professions is that little evidence exists related to safety and effectiveness of the relevant professions. It stands to reason, that adopting the evidence based approach is imperative to ensure that the profession is no longer compared to or included with some health professions that have limited or no evidence. The profession therefore needs to adopt this approach, if we are to address these pressures from external sources, and move forward into the health care arena where we are accepted as part of the multi disciplinary team in the treatment of neuromusculoskeletal conditions.
Educational Approaches
Many chiropractic institutions have already adopted the evidence based model, and as such curriculum is based on content that has sufficient evidence to withstand external scrutiny.

This design is important from the outset of student’s educational process. If the methods of presentation of information foster the process of self-development and critical analysis of information, then in essence the students are practicing the evidence based approach from the start of their studies. By ensuring this progressive approach, integrated into their every-day learning activities, the model of evidence based practice is not intimidating or foreign once they are exposed to clinical reasoning and practice in later years.

For this approach to work, the students need to be guided in the process of analysis (both of evidence and the process utilised by them to create this evidence) and the importance of research as a tool to be utilised when motivating or justifying responses to questions. Within the South African educational context, a Masters degree is the minimum requirement for registration to practice as a chiropractor. All students are therefore required to complete a dissertation prior to qualification. While potentially onerous, this process does have certain advantages. The students are required to think about and design research at a high level. Critical analysis is an important aspect of any research at this level, and facilitates graduates that are adept at self-directed learning and are able to source relevant information pertinent to a case in point. In essence, the first critical section of the evidence based paradigm. The process of teaching during the course of the student’s academic path is therefore focused on facilitation of this final process.

Numerous chiropractic programmes have also adopted the biopsychosocial model of health and disease. This approach facilitates the evidence based model, as it accepts that patient’s attitudes and beliefs are important aspects of disease, and need to be considered in relation to management and treatments of patients.

Philosophy or history of chiropractic is an additional important aspect in teaching the overall approach of evidence based practice, as the clinical decision making of the chiropractor must be based on chiropractic approaches to conditions. While debate exists related to the content and amount of philosophy presented, the important aspect is that the unique aspects of the chiropractic approach to patients and management of conditions. This needs to be emphasised at all levels of the academic process, with the focus on what has true evidence, and not based on information that has poor validity and could become a threat to the profession. Until the evidence exists to support claims, the focus must be on what we can prove.
Given the above discussion, the educational approach can be integrated into the evidence based model as demonstrated below:

Figure 3: Teaching the evidence based model

**Conclusion**
As an overarching concept, the evidence based model is an all-encompassing model, which allows for integration of current knowledge and chiropractic principles to achieve the best possible approach for treatments of patients. The challenge for all educational institutions is finding the balance between the components of the model, that will allow for a seamless integration of the process into clinical years and beyond into clinical practice. There can be no doubt in the current environment that the evidence based model is critical for the future development of chiropractic education and the profession at large.

**Bibliography**


Delaney P, Fernandez C. Applying evidence based health care to musculoskeletal patients as an education strategy for chiropractic interns (a one group pre-test post-test study) *Journal of Manipulative and Physiological Therapeutics* 2004;27:253-261

Johnson C. Highlights of the basic components of evidence based practice, *Journal of Manipulative and Physiological Therapeutics* 2008;31:91-92


Accreditation Criteria in the USA and the Evidence Supporting Them:  
An Accreditation Agency Perspective

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The purpose of chiropractic professional accreditation is twofold: 1) to promote academic excellence; and, 2) to ensure the integrity and quality of academic and clinical programs. Accreditation relies on evidence for reliability and validity of its processes, polices, standards and expected competencies. Accreditation includes voluntary peer review of professional programs that enhances the quality and assures the integrity of processes and of outcomes.

The process of accreditation has been established through a number of sources. The primary focus of contemporary professional accreditation is mission driven and outcomes based. The educational program establishes its mission, goals and objectives based on the standards of the profession and consistent the accreditation criteria of the accrediting agency. The educational program then engages in self-analysis and produces a self-study report that describes and assesses the program’s success in fulfilling its mission. The self-study report is submitted to the accrediting agency in application for accreditation status. The accrediting agency reviews and report, coordinates a site team visit to the program, and reviews the final report of the site team to determine whether the program meets the criteria for accreditation.

The above activities describe the accreditation process which has been developed using evidence gained from experience and study. Analysis of mission fulfillment to determine whether a program meets the criteria for accredited status relies heavily on the analysis of student learning outcomes, including clinical competencies established by the accrediting agency. These competencies are based on evidence that is gathered from a variety of sources. Additional outcomes that are considered by the accrediting agency include: student performance on standardized examinations; achievement of jurisdictional professional licensure by graduates of the program; student and graduate satisfaction surveys; and, student performance in program-developed standardized assessments and evaluations.

The process of accreditation that is employed including the agency’s policies and procedures is validated by recognition of the accrediting agency by governmental entities and other organizations including: state and other jurisdictional licensing bodies; the United States Department of Education; the Council for Higher Education Accreditation; the Councils on Chiropractic Education International; and, the Association of Specialized and Professional Accreditors.

The Council on Chiropractic Education® standards and criteria for accreditation are based on the model that a graduate of an accredited program is to be competent to practice as a primary care chiropractic physician. The definition of primary chiropractic
care is included in the glossary of the accreditation standards and is specific to this terminology.

The competencies required of program graduates are evidence-based and rely on sources that inform and establish the expectations of skill, knowledge and attitudes inherent to an entry-level chiropractic physician. These competencies are developed from several sources including: state and other jurisdictional licensing statues and rules regulating the scope and definition of practice for chiropractic physicians that establish the legal definition and descriptions of the profession; state and other jurisdictional chiropractic licensing and/or examining bodies; job analyses of practicing chiropractic physicians; chiropractic professional trade organizations; accredited educational programs; and, professional examining bodies such as the National Board of Chiropractic Examiners.
Accreditation Criteria in the USA and the Evidence Supporting Them: An Educator’s Perspective.

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Chiropractic accreditation is an important aspect of the chiropractic profession in the U.S., accomplishing several important objectives. First, it provides assurance of quality to other health care professions, to the government, and to the general public. Accredited status is a signal to students and the public that a doctor of chiropractic program meets at least threshold standards for its faculty, curriculum, student services, libraries, etc.

Second, accreditation provides access to federal and state funds for students. U.S. federal student aid funds are available to students only if the institution or program they are attending is accredited by a recognized accrediting organization. Of the $150 billion disbursed by the U.S. government each year for student loans and grants, about $400 million is disbursed to students studying chiropractic in accredited programs.

Third, accreditation engenders confidence in state regulators of chiropractic. Accreditation status of an institution or program is critical to state regulators when evaluating credentials of licensure applicants. In addition, private individuals and foundations look for evidence of accreditation when making decisions about private giving, and employers use accreditation as evidence when evaluating job applicants’ academic credentials.

In the U.S. there are about 80 agencies responsible for accrediting the thousands of higher educational institutions; six regional accrediting agencies accredit 4,000 institutions from an institutional perspective. In addition, there are three categories of national accrediting agencies: faith-based, career-based, and programmatic agencies. Chiropractic is accredited under the third category, as are the other health professions (medicine, optometry, acupuncture and oriental medicine, dentistry, etc.). The agency responsible for accrediting doctor of chiropractic programs is called the Council on Chiropractic Education (CCE).

The CCE is at an inflection point in its history. Despite its unquestioned contributions to chiropractic education in the United States, it finds itself at the center of a sustained firestorm or controversy, which has spilled over to the U.S. Department of Education and the U.S. Congress.

What role has using evidence-based practices played in this dilemma?

In a recently released study by the American Council on Education (Assuring Academic Quality in the 21st Century: Self-Regulation in a New Era, A Report of the ACE National
Task Force on Institutional Accreditation, 2012), commissioned in response to threats on the U.S. accreditation system by members of Congress, the following were noted as six best practices that accrediting agencies will need to exemplify in order to remain relevant in the 21st century:

- **Advance academic quality.** Accreditors have a clear description of academic quality and clear expectations that the institutions or programs they accredit have processes to determine whether quality standards are being met.

- **Demonstrate accountability.** Accreditors have standards that call for institutions and programs to provide consistent, reliable information about academic quality and student achievement to foster continuing public confidence and investment.

- **Encourage, where appropriate, self-scrutiny and planning for change and needed improvement.** Accreditors encourage self-scrutiny for change and needed improvement through ongoing self-examination in institutions and programs.

- **Employ appropriate and fair procedures in decision making.** Accreditors maintain appropriate and fair organizational policies and procedures that include effective checks and balances.

- **Demonstrate ongoing review of accreditation practice.** Accreditors undertake self-scrutiny of their accrediting activities.

- **Possess sufficient resources.** Accreditors have and maintain predictable and stable resources.

The CCE can be evaluated across each of these six dimensions; how the agency responds to the current outcry will dictate each ability to continue to function effectively.
Accreditation Criteria for Chiropractic Education in Europe

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Quality assurance in higher education takes many forms including university-based validation and professional accreditation. For chiropractic education in Europe, international accreditation is awarded by the European Council on Chiropractic Education (ECCE). In essence, this quality assurance agency, which undertakes periodic external reviews of chiropractic educational institutions, has, as its primary objective, recognition of education and training that produces graduates who are safe and competent to practice as primary contact healthcare practitioners. As a portal of entry to the healthcare system, the chiropractor must be well educated to diagnose, to care for the human body in health and disease, and to consult with, or refer to, other healthcare providers.

Accreditation (and re-accreditation) of institutions is determined by the quality of their chiropractic education and training programmes judged against a set of educational Standards. The Standards are intended for use by chiropractic institutions, both in the private and public sectors, predominately (but not exclusively) in Europe, in institutional self-evaluation of their educational programmes, and for use by international committees and bodies involved in the recognition and accreditation of chiropractic education worldwide.

In addition to accreditation of institutions, the ECCE is involved in establishing standards for the education and training of chiropractors, facilitation of quality enhancement and sharing of best practice between institutions. In other words, ECCE is not only a guardian of the standards of chiropractic education and training in Europe, but a focus for the continuous improvement of educational practice. This begs the question, ‘What is the evidence that the accreditation criteria utilised in the Standards are appropriate and ensure that they are fit for purpose?’

The Standards are themselves subject to review reflecting changes in the profession and in education practices. The current version (November 2011), is based both on earlier versions of the Standards and pertinent documentation and best practice (eg. the Councils on Chiropractic Education (CCEI) Model Standards (adopted January 2001), the World Federation of Medical Education (WFME) International Standards in Basic Medical Education, in addition to input from relevant stakeholders in chiropractic education.

Within Europe, the “Standards and Guidelines for Quality Assurance in the European Higher Education Area – 3rd Edition”, commonly referred to as the ESG act as the blueprint for higher education accreditation in Europe. Part 2 of the ESG describes standards and guidelines for the external quality assurance of higher education, while Part 3 describes standards and guidelines for external quality assurance agencies. In 2010 ECCE underwent an external evaluation of its processes and documentation by the
European Association for Quality Assurance in Higher Education (ENQA\(^{(4)}\)) to determine whether ECCE complied with Parts 2 and 3 of the ESG. ENQA has as its mission to disseminate information, experiences, and good practices in the field of quality assurance (QA) in higher education to European QA agencies, public authorities and higher education institutions. In order to assure quality in its policies and procedures ECCE determined that it was necessary for ENQA to undertake an external evaluation of ECCE. ENQA determined that ECCE complied with the ESG.

From an agency perspective, the ESG is firmly focused on the processes of external evaluation. Amongst other things the ESG highlights the need for independence of QA agencies, the involvement of students in evaluation teams and public access to evaluation reports and periodic reviews. All of these factors are important for transparency and accountability for agencies. The ESG is very clear that stakeholders in collaboration with the agency should determine subject-specific criteria for evaluations. Whilst one cannot be 100% certain that the correct measures of educational practices are utilised in accreditation criteria, collaboration with education institutions and educational specialists in addition to external evaluation by an independent 3\(^{rd}\) party goes a long way to ensuring best practice.

References

4. The European Association for Quality Assurance in Higher Education. www.enqa.eu
Evidence for Accreditation Standards: An Australian Perspective

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The formal accreditation of chiropractic first professional programs in Australia began in 1976. The Council on Chiropractic Education Australasia (CCEA) was incorporated on 27 February 2002 and is a joint Australian and New Zealand regional accreditation authority. It is the government appointed body responsible for accrediting chiropractic programs in Australia and New Zealand and has also accredited programs in Japan and South Korea. CCEA is a member of The Councils on Chiropractic Education International (CCEI)

Program accreditation traditionally has been carried out in a prescriptive and process-based format. In recent times, there has been a shift in education towards a more outcomes-based system, aligning and attaining clinical competencies and educational outcomes. This change has been primarily driven by society’s desire for safety, quality and accountability. At the same time, we see an increasing requirement to develop an evidence base to all that we do, and finally, we must seek to embrace the educational needs for the 21st century health care provider (eg, team oriented care, information literacy, research skills, practice-based learning)

Evidence for Accreditation

Does program accreditation impact upon patient care outcomes, graduate competencies, and/or quality of education?

Patient Outcomes

At present, there is a lack of hard evidence linking medical education to patient outcomes. Studies have examined various outcomes eg. malpractice claims, adverse events, morbidity and mortality, diabetes, etc. and have found no association between these and the quality of medical education (“quality” measured as formal vs informal education, accredited vs non-accredited education, and various other parameters). Educationally sensitive patient outcomes are yet to be identified.


Graduate Competencies

It does not appear that the quality of education, and the measuring of competencies are adequately linked. There is some evidence that exists for measuring competency of basic
knowledge and on management of individual cases (as Board exams do). 3 This is not adequately sufficient

A recent systematic review of the measurement of general competencies in medical education concluded, “it currently does not seem possible to sufficiently measure the competencies independently of one another in any psychometrically meaningful way.”

There is difficulty, complexity and less than satisfactory methods of reliably measuring student and graduate competencies. 4

Quality of Education

Health sector accreditation literature has demonstrated that the activity of preparing for and undergoing accreditation promotes and assists to take steps toward positive educational change. 5,6,7,8

Process versus Outcomes

An effective accreditation framework for healthcare education must incorporate patient care and educational infrastructure requirements that foster safe, well-functioning systems of care and training. An outcomes-only system of accreditation might overlook such protections and the infrastructures needed to support them. 9

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3. Ibid 1 above
9. Ibid. 1 above

Evidence - CCEA’s Framework for Standards?

While the move towards a competency/outcomes framework occurs, accreditation still remains one of process more than outcome. CCEA accreditation standards, derive from, and are congruent and mutually consistent with other medical/allied-health accreditation literature. Competencies are a part of the accreditation landscape for all registered healthcare professions in Australia.

CCEA accreditation standards are framed to specify attainment at two different levels: (a) basic minimum **must** requirements; and (b) standards for quality development (in
line with WFME Global Standards). This latter should requirement is in accordance with best practice consensus, quality improvement, plans for change and innovation.

Studies of the WFME “Global Standards” have shown effectiveness in that institutional self-evaluation based on these standards is a positive event and have fundamental positive influence on institutional reform processes with lasting constructive consequences.(10)

The Global Standards for Quality Improvement in Medical Education are validated in a number of studies and used by an increasing number of national agencies and institutions. (11,12)

The CCEA Standards are explicit relative to core competencies; must be focussed on educational outcomes; and align with the CCEA Competency-based Standards for Entry Level Chiropractors. Competencies can promote curriculum alignment as a basis for learning objectives(13), which in turn inform teaching methods, and assessment practices (14).

In summary, there is an ongoing growing evidence base. While there is a positive link between accreditation and quality of education, and some evidence to support the effectiveness of current accreditation standards, there is a need and a call for more high quality research into accreditation.

I wish to acknowledge Dr Jo-Anne Maire for her significant assistance in this project.


A Review of Orthopedic Tests

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With the introduction of new concepts such as evidence-based medicine (EBP), evidence-based approach (EBA), and evidence-based practice (EBP) since the early 90’s, today’s educational programs should be questioning the value of the traditional teaching of orthopaedic examinations. According to Sackett, evidence-based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients, which is in no doubt the common goal of all health care practitioners.

Thus, the practice and utilization of evidence-based knowledge means integrating our clinical expertise with the best available known clinical evidence. Fortunately, in the field of orthopaedics, the arrival of non-invasive arthroscopic surgery, as the gold standard, has provided great research opportunities to study the diagnostic accuracy of orthopaedic tests. In the last two decades, many studies have shown some good to excellent sensitivity and specificity for some orthopaedic tests but also have shown many traditionally utilized tests to be of no value or to have very limited clinical diagnostic values. Related research to evidence-based practice has evolved from determining probabilities by means of predictive values to likelihood ratios, which are derived from the sensitivity and the specificity of a test, to the utmost clinical diagnostic tool, the clinical prediction rules. It is believed that clinical prediction rules are usually most preferable when available because of their ability to better screen or incriminate a specific condition, however, they remain for most practitioners tedious to use.

This presentation on orthopaedic tests will briefly review the necessity and significance of several clinical criteria for the selection of the best available orthopaedic tests, such as the sensitivity, the specificity, and the likelihood ratios. The importance of having pretest and posttest probabilities such as likelihood ratios greater than 10 or less than 0.1, will be demonstrated by a brief clinical case presentation. We will review the signs and symptoms of a nurse with a soft tissue injury who underwent two different but similar orthopaedic examinations. Knowing her post-surgical results, which examination was the most likely conclusive will be revealed. The value of using clusters of clinical tests will be shown. To conclude with, the most promising top ten orthopaedic tests of the upper and lower extremities will be revealed with their respective diagnostic statistical results.
A Review of Palpation and Manual Tests:

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The efficacy of spinal manipulation has received increasing support over the years for the treatment of nonspecific/mechanical musculoskeletal pain. The ability, however, of the practitioner to identify the appropriate target for spinal manipulation remains controversial and currently there is no gold standard of how to accurately diagnosis a manipulative lesion. Chiropractors and other manual therapists use a variety of techniques in the examination of patients to determine if and where mobilisation/manipulation techniques should be applied, with palpation arguably being the most common diagnostic procedure used. Specifically motion palpation is considered to be the most frequently employed technique used by all manual therapists to identify abnormal from normal spinal mobility. Motion palpation is considered by some to be an essential part of any examination to guide manipulative interventions, possibly due to its high face validity (motion palpation would appear to be a reasonable test, given what it is being used to assess). Due to this general acceptance palpation techniques form a basic and fundamental part of the normal psychomotor/diagnostic skills taught within undergraduate chiropractic educational institutions worldwide.

For at least 30 years, researchers of manual medicine have studied the reliability of many of the commonly used palpatory diagnostic tests. The majority of evidence, paradoxically, indicates that palpation is of questionable clinical value for assessing spinal segmental dysfunction in the absence of pain, as it has consistently failed to show levels of reproducibility that supports it use in evidence-based clinical practice. Many of the trials that have shown low inter and intra examiner reliability rates however have been criticized for not reflecting clinical practice and/or having low methodological quality, thus limiting the strength of their findings. Notwithstanding such methodological short falls, this lack of validity and reliability has lead to calls for palpation to no longer be taught within undergraduate and post-graduate chiropractic education and for the chiropractic profession to move away from using these techniques to diagnose the presence or otherwise of manipulative lesions. A recent thoracic spine motion palpation study however showed a ‘good’ level of inter-examiner agreement when examiners were ‘very confident’ as to the most fixated spinal segment. This high level of agreement is a rarity in palpation studies and is possibly related to the fact that examiners confidence levels were taken into consideration when assessing segmental dysfunction. This may reflect the clinical decision making process more closely than previous work in this area and may act as a model for future research.

There is no denying that the weight of evidence currently questions many long held beliefs concerning the validity of palpation in the examination and diagnosis of spinal joint dysfunction. Is it time however for chiropractors and other manual
therapists to abandon its use, or is it time that we recognize its shortfalls and limitations and adapt our clinical practice accordingly? With this in mind various authors have suggested that the validity of palpation may be improved by combining it with a number of other assessments or tests\(^7,19,20\). This has lead to various acronyms being suggested by the chiropractic (PARTS: pain, asymmetry, range of motion, tone/texture/temperature and special tests) and osteopathic professions (TART: tenderness, asymmetry, restricted range of motion and tissue texture or STAR: symptom reproduction, asymmetry, restricted range of motion and tissue texture) in an effort to improve the validity of spinal dysfunction assessment\(^6,21\). There is however need for further quality research to support these multidimensional approaches. Within chiropractic undergraduate education it is important that educators are open and honest regarding the validity of palpation and explain that in isolation it may be of limited diagnostic value in identifying spinal dysfunction, even if this is contrary to many of the strongly held beliefs within the profession.

References


Translating Evidence into Practice: A Review of Neurology Tests

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The neurological examination is a core component of any chiropractic physical assessment. As a budding young chiropractor learning to perform a neurological examination in the 1990’s Hoppenfeld’s Orthopaedic Neurology: A Diagnostic Guide to Neurologic Levels was one of the ‘bibles’ I referred to. It is interesting to note that 35 years after first being published Hoppenfeld is still a recommended text for various state and board licensure examinations today. Hoppenfeld made it seem so simple, an S1 nerve root lesion will result in weakness of the foot evertors, a reduced Achilles reflex and loss of sensation over the lateral foot. Having seen many patients in practice over the years who obviously forgot to read Hoppenfeld’s seminal text it seemed like a timely exercise to review the evidence base associated with some of the fundamental components of the neurological examination that is routinely performed in chiropractic offices around the world. This presentation will focus on the diagnostic accuracy of dermatomal sensory tests, muscle stretch reflex tests and muscle strength tests with respect to identifying the level of herniation in patients with sciatica. I will also discuss the evidence associated with what has been described as the most important sign in neurology, the Babinski sign.

Surprisingly, little is known about the diagnostic accuracy of the neurological examination for identifying the level of a disc herniation. In their study of 283 patients with sciatica and a radiologically confirmed disc herniation, Hancock et al (2011) reported that none of the individual neurological tests commonly used to identify the level of disc herniation were highly accurate. Combinations of tests were slightly more accurate and resulted in high specificity but sensitivity was poor. Unfortunately the news from this study isn’t good for a budding chiropractor who is expecting to diagnose an L5/S1 disc herniation with ease based on Hoppenfeld’s words of wisdom. In patients with a radiologically confirmed L5/S1 disc herniation sensory loss of the S1 dermatome revealed sensitivity of 0.59, specificity of 0.60 and an area under the ROC curve of 0.60, which is considered to be poor. Loss of the ankle reflex was only marginally better with sensitivity of 0.48, specificity of 0.83 and area under the ROC curve of 0.66. Weakness of foot evertors was even worse with sensitivity of 0.34, specificity of 0.51 and area under the ROC curve of 0.43. All is not lost though, as when a neurologist was free to perform any clinical examination they felt was appropriate their diagnostic accuracy improved to 0.81 for sensitivity, 0.81 for specificity and 0.81 under the curve for a central L5/S1 disc herniation.

The news is not much better for another essential component of the neurological examination, testing for the Babinski sign. It is considered by some to be the most important sign in neurology yet there often appears to be little agreement between examiners on whether or not the sign is present. Miller and Johnston (2005) reported
that Babinski’s sign was unreliable and a poor predictor of upper motor neuron weakness. In their study comparing the results from 10 physicians they found a kappa of only 0.3 when testing the reliability of the Babinski sign, and only 56% agreement with known upper motor neuron weakness.

Despite these somewhat discouraging findings for individual neurological tests, it must be acknowledged that no test is performed in isolation. The role of the neurological examination is to test hypotheses derived during the case history. Neurological tests always need to be considered in the context of the patients presenting complaint, history findings, and the results of other components of the physical examination. This presentation will explore these areas of the neurological examination in greater detail and discuss how this evidence can be translated into practice.

References
Diffusion of Innovation: An EBCP Faculty Development Program for Chiropractic College Faculty

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Enhancing the evidence-based clinical practice (EBCP) attitudes, knowledge, skills and teaching behavior of faculty is critical to effective delivery of these concepts to students, and is a direct way of influencing an educational culture. This paper describes the key strategies used in a multi-method EBCP faculty development program in place at a chiropractic college over the past 4 years.

Faculty development program

We developed a series of strategies based upon the general framework of diffusion theory and a broad train-the-trainer model to integrate EBCP into our doctor of chiropractic (DC) training program. We recognized that the ability and willingness of faculty to adopt EBCP concepts falls on a continuum from innovators and early adopters to laggards. Diffusion theory suggests that opinion leaders and change agents provide powerful leverage for adoption of innovations such as EBCP. We based our training program on the core competencies of the evidence cycle: ask, acquire, appraise, apply and assess.

Our first key strategy was to identify cohorts of faculty who were viewed as opinion leaders and innovators to participate in the initial stage of our faculty development program. We invited 12 classroom faculty from across all years of the DC curriculum to participate in one “early adopters” training group and 8 clinic faculty to participate in a second group. The faculty cohorts were led by facilitators with training in EBCP. Both used a small-group learning community format with a sustained series of dedicated meetings. The first year was devoted to learning the principles of EBCP and applying them to relevant clinical literature. The meetings consisted of lectures, readings, interactive exercises and discussions, and additional small group meetings and online discourse as needed. During the second year, the classroom faculty focused on incorporating EBCP principles and competencies into their courses and revising respective course learning objectives and syllabi, while the clinic faculty developed small projects targeted at clinic interns.

Our second key strategy was to develop an annual 2-day off-campus workshop retreat in EBCP. The purpose of the workshop was to educate faculty in EBCP principles and practice, as well as effective pedagogical methods for teaching EBCP. The workshop was hosted and led by a collaborator at a nearby medical college who conducts courses on how to integrate EBCP into educational programs and busy clinical education settings at both his institution and as a faculty instructor at McMaster University’s week-long
training program “How to Teach EBCP.” He modeled the 2-day workshop on the McMaster program utilizing a mix of large and small group sessions.

Our third key strategy was to send select faculty to participate in the McMaster program. This immersion program is designed for educators who want to improve their EBCP teaching skills. The core of the program revolves around small-group interactive sessions with role play. There are multiple instructors per small-group who create a protected environment that encourages open exchange of ideas among the participants including plenty of opportunity for individual feedback. The early adopters; faculty who had attended the 2-day workshop were eligible to apply for support to attend the program. Faculty were chosen based upon the quality of their application and the potential impact of their training on the curriculum.

**Outcomes**

Approximately 25 faculty trained as early adopters. A total of 73 faculty participated in at least one of the 2-day workshop retreats. We provided funding and release time enabling 19 faculty to attend the McMaster program at least once. In the past 2 years, the early adopter cohorts have given over 5 presentations and led 9 interactive sessions on EBCP for faculty at in-services and other programs offered through our Center for Teaching and Learning and 17 clinical professional training modules.

Two members of the classroom early adopters developed a course on the foundations of EBCP that was added as a required course in the first term and two substantially revised existing courses in information literacy and evidence-based chiropractic. Early adopters also integrated EBCP into courses throughout the curriculum including at least 15 that have explicit EBCP-based learning outcomes.

Two members of the clinic early adopters incorporated an EBCP component into required quantitative assessment exercises in clinical radiology and several are using and modeling EBCP with students during internal rounds. Mechanisms are being developed to incorporate EBCP into daily clinic operations.

We have measured the EBCP attitudes, perceived skills and teaching behaviors longitudinally over the course of the faculty development program through surveys, focus groups and interviews. Surveys conducted in workshops and seminars indicated high satisfaction and program value and increased perceived skills. Themes emerging from focus groups included: most faculty and students are open to the continuing implementation of EBCP; excited and committed faculty can constitute driving forces; faculty buy-in to EBCP is increasing; strong administrative support is important; and the workshop retreats and McMaster program are outstanding training opportunities that must continue if the implementation of EBCP is to be successful. Semi-structured interviews with early adopters showed a marked increase in collegiality and collaboration.

**Conclusions**

Training faculty in EBCP principles, practice and pedagogy can be resource intensive. Our model of focusing initial training on early adopters and likely agents of change can
leverage a college’s human and fiscal resources for the greatest curricular impact. Program success depends on strong institutional support that provides critical elements such as release time, recognition of this work in promotion considerations, and access to EBCP expertise for faculty. The ability of faculty to successfully integrate EBCP concepts and practices into the curriculum and clinical rotation experience will prepare graduates to consider EBCP as integral to chiropractic practice and better prepare them to practice in our modern healthcare environment.

Acknowledgment
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The 4-Year Evolution of a Workshop on Evidence-Based Clinical Practice for Chiropractic College Faculty

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The ability to successfully prepare students to practice modern evidence-based healthcare depends in great part on faculty ability to teach research literacy, integrate evidence in both didactic and clinical training and model evidence-based clinical practice (EBCP) behavior. This paper describes the development and evolution of one key strategy in a multifaceted EBCP faculty development program at a chiropractic college: a 2 day off-campus immersion workshop.

Development and evolution of the workshop
The purpose of the workshop was to educate faculty in EBCP principles and practice, as well as the pedagogy of teaching EBCP. The workshop was hosted by a collaborator at a nearby medical college who conducts educational courses to convey EBCP concepts for practicing clinicians, teaching faculty and medical residents at both his institution and as a faculty instructor (tutor) at McMaster University’s seminal week-long training program “How to Teach EBCP.” His particular emphasis is on how to integrate EBCP into overcrowded educational programs and busy clinical education settings. He modeled the 2-day workshop on the McMaster program utilizing a mix of large and small group sessions with a focus on learners’ needs.1 The workshop was held in a computer lab of his institution with small rooms available for break-out sessions.

For the first workshop, our collaborator was the lead instructor with the assistance of 2 members of his medical faculty and a medical college librarian, all of whom were trained through the McMaster program. Large group sessions included defining EBCP as a process, asking clinical questions, facilitated hands-on database searching, critical appraisal skill development and interpreting clinical research results. There were facilitated small group sessions each day that focused on critical appraisal of articles. A separate initiative of the training program was to provide funding and release time for select faculty members to attend the McMaster program every year. For the second workshop, 3 faculty who had attended the McMaster program were invited to participate as small group facilitators and assisted in selecting chiropractic-relevant articles for use in the workshop.

We began a mentorship model based on the McMaster tutor-trainee program for the third workshop. Four faculty who had attended the McMaster program were invited to co-organize the workshop, facilitate small group activities and take the lead in developing and teaching a number of sessions under the guidance of our collaborator. He worked with these tutor-trainees through teleconferences and campus visits to
prepare for the workshop. During the workshop, he provided individualized feedback to further develop them as EBCP teachers.

We continued to enhance this mentorship model for the fourth workshop. The tutor-trainees from the third workshop developed the workshop program with our collaborator, and developed roles for 7 additional faculty who had attended the McMaster program. These new tutor-trainees facilitated small group sessions both individually and in pairs with coaching from their more experienced peers. In addition, all of these tutor-trainees had lunch with our collaborator both days to de-brief on their experiences.

Workshop participants
Each workshop had between 19-22 learners which included college administrators, basic and clinical science classroom faculty, clinic faculty and a research fellow, in addition to the faculty tutor-trainees. Each workshop participant was individually selected and provided travel support and work-release. Administrators who could facilitate EBCP activities and faculty who were identified as potential change agents on campus were targeted. The off-campus location aided in minimizing interruptions and distractions to enable immersion in the material for the entire 2-day program.

Outcomes
A total of 73 faculty participated in at least one workshop. Only one faculty member declined an invitation to attend, although a few could not participate due to scheduling conflicts. Surveys were conducted at each workshop to gauge information gained, skills development, effectiveness of the delivery methods and applicability to teaching. Participants found the programs to be valuable, well-organized and well-presented. Confidence in EBCP skills rose and the information was deemed to be applicable in many teaching environments.

Conclusions
Building a workshop in EBCP requires expertise. We were fortunate to identify a collaborator with significant expertise and teaching experience. To sustain the workshop and enhance its relevance required developing internal expertise. This is reflected in the expanding participation of our faculty teaching the program.

Selection of participants was purposeful with the intention of leveraging as much influence on curricular delivery as possible. Faculty were selected based on their likelihood of engaging, their potential influence on other faculty, and their position in departments and the curriculum. The off-campus location fostered collegial interaction and prevented interruptions. The fact that faculty were selected and invited to participate reinforced the value the institution placed on both the individuals and the program. When the initial workshop was presented, EBCP concepts were not well known and actually viewed with suspicion by some faculty on our campus. Participation in the workshop served to quell most concerns.
The focus of the workshop was on both learning EBCP and learning to teach EBCP. Not only were EBCP concepts introduced, but teaching concepts were reviewed and demonstrated. Surveys and feedback from each workshop informed the development of the next. This led to program improvements such as using chiropractic-relevant literature for critical appraisal, focused exercises in database searching, and the presentation of short “snippets” (examples of teaching EBCP concepts in real life circumstances, including the classroom, during clinic rounds and hallway opportunities between patients). The workshop is a key element in establishing a sustainable cadre of EBCP educators at our college and can be modeled at other institutions.

Enhancing the EBCP attitudes, knowledge, skills and teaching behavior of faculty is critical to the effective delivery of these concepts to students. Instilling these concepts into our students will foster habits of lifelong learning and professional development ultimately leading to improved patient outcomes and better inter-professional communication.

Reference

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Problems Implementing EBP

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When utilized as a rhetorical weapon to discredit those with whom they may hold grievance some disciples of the evidence based movement justify their position on the assumption that the process of decision making in the clinical context is identical to that utilized in the laboratory. In such an environment the luxury of dealing with cold hard facts as afforded from an unashamedly positivist perspective renders the slippery nature of and inherently human uncertainty associated with the provision of health care as something to be avoided and, importantly capable of being avoided, at all costs.

The recent and ongoing criticism of the chiropractic profession by the “Friends of Science and Medicine” is demonstrative of this analytical and political position. Chiropractors are portrayed as failing to deliver the type of “real” evidence which is required to justify their practices and theoretical base. The evidence to support chiropractic is “soft” and its practitioners “magicians” rather than scientists. This is in strong contrast to other professionals whose practices are portrayed as thoroughly ground in “the evidence”. Practitioners of such disciplines such as medicine are presented as objective and neutral scientists who, in the true scientific tradition, are only too willing to abandon the practices they may have utilized for decades, in the face of new evidence.

This is, of course a fantasy. The assumption that health care practitioners would unquestioningly embrace the principles and practice of evidence based medicine has proven to be ill founded time and time again. Whilst it was assumed those at the coalface would find the scientific rationality of EBM irresistible, evidence that the evidence was on shaky grounds did not take long to appear. Whilst several barriers to the implementation of EBM in primary practice have been identified it seems practitioners are fundamentally unwilling to disregard, much less abandon less formal sources of knowledge to inform their activities. Evidence acquired through their personal and the collective clinical experience of their colleagues is both highly regarded and used extensively by practitioners.

Trish Greenhalgh provides us with the following sobering analysis of such a position...“Those who have studied the phenomenon of clinical disagreement as well as those of us who practice medicine in a clinical setting, know all too well that clinical judgments are usually a far cry from the objective analysis of a set of eminently measureable “facts”.

In this presentation I elucidate research data which demonstrates that health care practitioners of all disciplines are not prepared to abandon phenomena such as clinical
acumen and experience when it comes to clinical decision making in health care practice. This cannot and should not be accounted for in terms of any lack of knowledge of method or ignorance of what constitutes proper and formal evidence based practice on behalf of practitioners, but rather is a reflection of the inherently human nature of healing.
Anatomy as a Medium for the Development of Research Skills for Chiropractic Students

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Anatomy has traditionally been one of the core pre-clinical subjects in chiropractic education. It has been perceived as a foundation discipline, but at the same time as a dry and difficult subject, where rote learning and endless repetitions are the main modes of acquiring new knowledge. Numerous recent developments in anatomy education, however, have induced a change in the image of anatomy, presenting the discipline as more “user-friendly”. These developments include devising strategies for easier learning while also raising awareness of anatomy’s applicability and clinical relevance. Furthermore, anatomy is also seen as a possible medium in which competencies other than anatomical could be successfully introduced, such as clinical skills and professionalism. In this paper we argue that anatomy can be successfully used in developing research capabilities for chiropractic students.

The chiropractic program at Macquarie University includes three years of undergraduate (consisting of pre-clinical and clinical subjects) and two years of postgraduate (clinical subjects) studies. Anatomy comprises four one-semester units (modules) taught within the first four semesters of chiropractic undergraduate education, a semester consisting of 13 teaching weeks. The anatomy curriculum is rooted in the latest theoretical developments in anatomy education and based on extensive input from practicing chiropractors and those in academia. Special attention is paid to horizontal and vertical integration, incorporation of applied, surface and clinical aspects of anatomy and use of medical images. Anatomy teaching is also seen as dynamic and constantly evolving. Most recently, we introduced strategies to facilitate development of research skills as part of anatomy teaching. To illustrate this strategy we provide two osteology based examples - one activity devised for undergraduate and the other for postgraduate students.

At the undergraduate level, students have to acquire a sound knowledge of anatomical structures and learn how to apply that knowledge. With regards to the anatomy of the skull, students develop an in-depth knowledge of the bones, their integration and relations as well as the architecture of the skull as a whole. Among other subjects, students learn various bony features, regions and osteometric points. In the proposed activity, carried out in the anatomy laboratory, we suggest that students are not asked to simply identify these bony elements. They are rather required to make measurements (between these defined points) and calculate indices. For example, one of the activities is to calculate cephalic indices of the skulls provided. From the lab manual students are able to find out how the index is calculated and which anthropometric points they need to identify in order to make the required...
measurements. A similar exercise focusing on the lower limb presents a task of
calculating the crural index. As students carry out these activities, they not only learn
anatomy more efficiently and in a more engaging manner, they also learn some of the
basic research concepts such as accuracy, repeatability, and inter- and intra-observer
error. They also adopt elementary research skills such as making measurements, simple
data analysis and descriptive statistics.

At the postgraduate level, all fifth year chiropractic students are required to complete a
research project. This project can be anatomy based and still have a strong clinical focus
relevant to chiropractic (indeed, one of the major challenges in vertical integration of
anatomy is not the inclusion of clinical elements into anatomy teaching, but re-visiting
of anatomy in clinical subjects). Thus, the project to be carried out this year focuses on
identifying and analyzing pathological specimens in Macquarie University’s collection of
human skeletons. Students use their knowledge of anatomy and apply critical thinking,
clinical expertise and a variety of methodological approaches in identifying pathological
conditions. After identifying a fractured skull, for example, they use other techniques
and procedures (X-rays, computed tomography, etc.) to establish whether the fracture
was induced ante-, peri- or post-mortem. In these more complex postgraduate research
projects, students adopt more advanced scientific concepts such as construction of a
hypothesis, its corroboration and falsification, etc. The activities help develop more
comprehensive research skills including application of inferential statistics, and
discussing and presenting research results.

The activities we propose are easy to implement and foster collaboration between
academics involved in basic sciences and those in clinical subjects; they are time
efficient and can be applied with a minimum of financial cost. The activities enable
students to learn difficult anatomical material while applying it within the clinical
context, improving critical thinking and developing research skills. This strategy of
learning anatomy and developing clinical and research skills has deep roots in
chiropractic education. Indeed, it was none other than D. D. Palmer who recognized the
importance of osteological collections in education and started building up one such
collection himself. The activities to develop research competencies for chiropractic
students within the anatomy curriculum, therefore, synthesize traditional chiropractic
values with the best elements of modern, evidence-based practice.
What level of anatomy for chiropractic students?

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Introduction
Accreditation boards worldwide set standards for entry level chiropractors including anatomy. Anatomy training is expected to provide the students with skill, knowledge and mastery to support competent practice with emphasis on the musculoskeletal and nervous systems. A brief review of websites from eight chiropractic schools indicates that courses of anatomy differ. The reasons for this unclear but suggest that there is a case to design a best practice course of anatomy so that a chiropractor will be able to practice optimally. We could not locate any previous substantive study on this topic. The aim of this study was to survey anatomists who teach chiropractic students and also practising chiropractors to obtain their opinion about optimum levels of anatomy.

Methods
We conducted two surveys; the first asked the opinion of anatomists teaching in chiropractic schools worldwide about emphasis on different elements of anatomy. The second repeated the survey on practising chiropractors. The project was approved by the Ethics Committee of Murdoch University.

Recruitment
We obtained the names of anatomists teaching in chiropractic programs by scanning the websites and emailing these institutions. For chiropractors we recruited chiropractors by using third party organisations.

Instrument of measurement
The survey questionnaire was administered anonymously online using Survey Monkey. Questions were based on Blooms taxonomy which is a hierarchical classification of learning objectives (Figure 1). We asked anatomists and chiropractors to give their opinion about the level of anatomy knowledge needed to be a competent chiropractor.

Statistical analysis
We used descriptive statistics to describe the answer elements of each question for anatomists and chiropractors.

Figure 1. Blooms Taxonomy
Results:
Forty anatomists were emailed of these 18 responded to the survey. Of chiropractors 563 responded to the survey. They resided in many different countries. Mean years of experience were 14, range 1-40.

Table 1 displays the results for both groups.
The majority of participants chose levels 3 to 5 for required anatomy knowledge. In general practising chiropractors believed a higher level of knowledge was required than did anatomists.

Table 1. Summary of survey results.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Anatomists n=18</th>
<th>Chiropractor s n=562</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationship of the morphology of bones, joints and muscles</td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>with their basic function</td>
<td>4.24</td>
<td>5</td>
</tr>
<tr>
<td>Function nervous system</td>
<td>4.18</td>
<td>4</td>
</tr>
<tr>
<td>Function joints</td>
<td>4.12</td>
<td>4</td>
</tr>
<tr>
<td>Function human muscles</td>
<td>3.94</td>
<td>4</td>
</tr>
<tr>
<td>Function human bone and joint</td>
<td>3.88</td>
<td>4</td>
</tr>
<tr>
<td>Morphology joints</td>
<td>3.88</td>
<td>4</td>
</tr>
<tr>
<td>Morphology &amp; topography skeletal muscles</td>
<td>3.76</td>
<td>4</td>
</tr>
<tr>
<td>Morphology human bone and joint</td>
<td>3.71</td>
<td>3</td>
</tr>
<tr>
<td>Morphology human nervous system</td>
<td>3.59</td>
<td>4</td>
</tr>
<tr>
<td>Relationship morphology of organs and tissues with their basic function</td>
<td>3.53</td>
<td>4</td>
</tr>
<tr>
<td>Function of organs and other human structures</td>
<td>3.41</td>
<td>3</td>
</tr>
<tr>
<td>Morphology &amp; topography of organs and other human structures for rehabilitation</td>
<td>3.39</td>
<td>4</td>
</tr>
<tr>
<td>Function of organs and other human structures</td>
<td>3.35</td>
<td>3</td>
</tr>
<tr>
<td>Morphology &amp; topography of organs and other human structures</td>
<td>3.06</td>
<td>3</td>
</tr>
<tr>
<td>Physical variations of human body</td>
<td>3.06</td>
<td>3</td>
</tr>
<tr>
<td>Respect and work with human cadavers</td>
<td>3.53</td>
<td>3</td>
</tr>
</tbody>
</table>

Discussion
It is clear that a high level of anatomy training is demanded by both anatomists but especially practising chiropractors. This may be linked to chiropractors being primary contact practitioners who have a special interest in the musculo-skeletal and nervous systems. It may also reflect the demands of day to day practice and the skills required to undertake a complete physical examination.
The study had limitations including response rates by anatomists and potential volunteer bias by chiropractic respondents. The bias direction is unknown but it may limit external validity. Future research may include a Delphi process of key educational
policy makers using these results as a basis. Further analysis will inform a proposed uniform anatomy teaching syllabus for chiropractic programs.

Reference

Figure 1. Bloom’s taxonomy
2 - Remembering or recall The student is able to retrieve, recognise and recall relevant knowledge. Example: recite the names of structures
3 - Understanding The student is able to understand the meaning and interpretation of anatomy. Example: the student is able to explain it in their own words
4 - Applying The student is able to use a concept in a new way or apply what was learned. Example: When the student resists the patient’s knee flexion it is the hamstring muscle that is contracting
5 - Analysis The student is able to break the material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose. Example: analysing how the biceps brachii muscle moves the shoulder and elbow in relation to its origin and insertion
6 - Evaluating The student is able to make judgements based on criteria and standards through checking and critiquing. Example: the student can hypothesise why the patient is still able to flex their elbow even though the biceps brachii muscle is completely torn
7 - Remembering or recall The student is able to retrieve, recognise and recall relevant knowledge. Example: recite the names of structures
8 - Understanding The student is able to understand the meaning and interpretation of anatomy. Example: the student is able to explain it in their own words
9 - Applying The student is able to use a concept in a new way or apply what was learned. Example: When the student resists the patient’s knee flexion it is the hamstring muscle that is contracting
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11 - Evaluating The student is able to make judgements based on criteria and standards through checking and critiquing. Example: the student can hypothesise why the patient is still able to flex their elbow even though the biceps brachii muscle is completely torn
The Double Edged Sword of Chiropractic Semantics

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The association between language and knowledge is well established[1]. Alfred Korzybski discussed the significance of a concept called 'time binding' where language is used as a 'tool' to reflect knowledge that is built up over time leading to the development of an epistemology[2]. The language we use to describe chiropractic tells of ideas and beliefs which in differing ways and, perhaps unknowingly to us, mislead and channel us into 'arguments' resulting in false conclusions and conflicts.

When someone from the general public, scientific or political communities is asked about chiropractic, it is not surprising to hear differing generalised assumptions. The Skeptic Organisation and the 'Friends of Science' (FOS) are highly active in Australia. These groups „see“ the word 'chiropractic' as synonymous with non-evidence based practice. For example, the use of the word subluxation has a more political and clinical meaning than a scientific meaning. The Skeptics and FOS perceive the word subluxation as 'dogma', or a word that is intended to be self-evident as opposed to a word that is embedded in evolving scientific principles.

The aim of this paper is to firstly propose a change of language when 'defining' chiropractic to scientific and political groups. The purpose is to address wrong opinions, misperceptions and assumptions made about chiropractic that are not reflective of an evidenced informed discipline based on critical thought and enquiry. Secondly (paper 2), a proposal is presented to address ‘the thinking culture’ in chiropractic schools and outline a ‘map’ for educational learning that reflects evidence informed practice. This paper is aimed at all members of the chiropractic profession, particularly political chiropractic bodies (professional associations) and educational institutions. “Language skills bind our learning from one time to the next. This „Time Binding“ is what sets humans apart. Thus, the language we use, in particular the structure of this language, should reflect the structure of our evolving, evidence-based principles and this should be learned early in a chiropractor”s professional career. Such learning needs to start as a student.”

The question is: How can we change this 'non-evidence based perception' of the chiropractic profession to better reflect the practice of our teachings?

For the short term, the answer lies with paying special attention to the language used by chiropractic professionals including practitioners, politicians, researchers and students to describe chiropractic. For the long term, the challenge is to further develop a thinking and analytical culture we imbed in our students ... who are soon to become new professionals. The latter will be addressed in the second paper.
It is noteworthy that the word 'chiropractic' does not necessarily give validity to the construct of chiropractic. The double edged sword of chiropractic, in the context of this paper, one side, outlines the benefits of chiropractic to our clients, who accept what we say without question. And on the other side, a static model may be perceived by the general public and members of the chiropractic profession. Where historical concepts are embedded within the unchanging definition of chiropractic. These historical concepts of the profession are used when defining the profession or stating what it 'is'. As a result, in the scientific arena, chiropractic is perceived as static and incongruent with evidence based enquiry. How chiropractic is marketed to clients, scientists and politicians may differ from how we teach it to our students. When marketing to the general public, scientists and politicians, chiropractors and chiropractic educators should use a language that denotes the evolutionary character of our beliefs reflecting our evidence informed practices.

A more pragmatic approach is required to communicate the benefits of chiropractic care. When addressing the identity of Chiropractic and what it 'is' the profession and it's teachings should not use verbal constructs, definitions, conventional formulae as its interface if we wish to generate a 'meaning' or reaction synonymous with chiropractic being a dynamic, evidence informed discipline. A language is required that revolves around 'how', emphasising what we do rather than what it 'is'.

Those who identify chiropractic with what it „is“ may be reluctant because they fear the research might undermine their premise. Hence evidence based principles may not be embraced and communicated in such a way that suggests an evolving profession. In other words, chiropractors who are reluctant to think of subluxation as a 'hypothesis' demonstrate a limited understanding of the significance of our epistemology. The profession ends up defending a definition rather than highlighting our investigative skills and knowledgeable practices.

In conclusion, the chiropractic profession, when dealing with the scientific community, members of health disciplines and political stakeholders, need to use a language that expresses what chiropractic does, rather than verbal constructs that state what chiropractic 'is'. The language we use should reflect a dynamic profession that is evolving with the times. Chiropractors must 'extend' its evidence-based framework to inform clinical practice. Paper 2 will address 'extensional models' that realise a person's epistemological style and a systematic method for the development of an analytical thinking culture reflecting an evidence informed culture.

Factors that Increase the Risk of CVA after CSMT

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Macquarie University, Australia

Abstract

Objective: To identify key factors which may increase the possibility of cerebro-vascular accidents (CVA) or stroke after chiropractic spinal manipulation therapy (CSMT).

Method: A systematic search of the Medline and Pubmed databases (from 1991-2011) was conducted for studies using the keywords chiropractic and stroke. Each paper was reviewed to examine any description of the key factors for stroke, the relationship or characteristics of treatment, and the severity of the stroke. In addition, other items that were assessed included the presence of multiple risk factors, neck pain, and headache.

Results: The key factors for stroke were identified from the existing literature on cerebro-vascular accidents. These were history of hypertension, hyperlipidaemia, atherosclerosis, connective tissue abnormalities, hyperhomocysteinaemia, diabetes, use of oral contraceptive pill, smoking, recent infection, and migraine. The search of the databases initially identified 57 papers that fulfilled search criteria. From these 57 papers, case reports were retrieved for review, as these should have contained details on known risk factors for CVA. However, the critical review of the case reports (n=22) found many significant omissions. That is, from the 220 variables that should have been recorded, over 95% were not noted.

Discussion: Stroke has been identified as a rare complication potentially following any neck movement. For example, cases have been reported following reversing a car, playing sport or yoga. Many cases reviewed in this systematic review did not note a clear timeline of events after the CSMT and the onset of stroke. Also, as most cases assessing CSMT and stroke did not identify well established confounding variables, it is not possible to determine whether CSMT is a significant risk factor for stroke.

Conclusion: Chiropractors should be vigilant in recording established risk factors for stroke in all cases, but especially where significant risks for CVA are present. It is possible that the published cases of CSMT and stroke may have missed important confounding risk factors.

Keywords (MeSH): chiropractic, spinal manipulative therapy, stroke, vertebral artery dissection
An Evidence-Based Health Promotion Activity, Developed With Professional Consensus: “Just Start Walking”

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Ron Kirk MA, DC

National Board of Chiropractic Examiners, USA

Introduction: the Problem
With the continuing trend of increasing development and modernization, sedentary living and its attendant disorders are escalating globally at alarming rates. In the developed world, chronic hypokinetic diseases related to sedentary living comprise the principal causes of mortality and morbidity. The pandemic of sedentary living and its attendant disorders were so widespread in the year 2000, that a team of global health leaders called for —promoting physical activity: the new imperative for public health || (Sparling, Owen, Lambert, & Haskell, 2000). In the U.S., 66% of adults were overweight or obese in 2004. This percentage is projected to rise to 75% by the year 2015 with 41% of adults being obese (Wang & Beydoun, 2007).

Health authorities have noted —the irrefutable evidence|| that increasing regular activity is —effective in the primary and secondary prevention of several chronic diseases (e.g., cardiovascular disease, diabetes, cancer, hypertension, obesity, depression and osteoporosis) and premature death || (Warburton, Nicol, & Bredin, 2006, p. 174). In view of this evidence the critical question then becomes, What can and should chiropractic practitioners do to improve physical activity levels in their communities?

Delphi: a Consensus Catalyst for Decision-Making
To address this issue, a seed panel facilitator (RK) invited nine seed panelists to contribute short and simple draft activity modules using PowerPoint slides in areas of their interest/expertise. These chiropractors (all with experience and training in health promotion and physical activity) had previously helped develop the well-received spinal health promotion program, —Straighten Up.|| Several preliminary activity modules, based on the panelists’ clinical expertise and reviews of the scientific literature were submitted. The seed panel then selected a draft walking module (submitted by JH) for further Delphi panel review and refinement based on walking’s universal appeal and well-known physical and mental health benefits (Penedo & Dahn, 2005).

The Delphi group communication process was developed to solve complex problems through structured consensus review. (de Meyrick, 2006) Given the current sedentary living/inactivity scenario, it is clear that attempting to increase activity levels in sedentary societies qualifies as a complex problem. Sedentary living has strong psychosocial and environmental determinants and ramifications. (Bauman, Sallis, Dzewaltowski, & Owen, 2002).
Delphi Panel Formation and Activities
The Delphi facilitator (RK) issued invitations in person to individuals and to groups at national and international conferences to assemble a broadly-based multidisciplinary Delphi panel. Individuals who agreed to participate on the Delphi panel included: chiropractic college and university presidents, chief academic officers, researchers, and chief clinical officers, leaders of Clusters of the World Health Organization, of the International Red Cross, at the United Nations, with the Bone and Joint Decade and the United States Bone and Joint Decade, and the World Federation of Chiropractic. Leaders in the Association of Chiropractic Colleges, the American Chiropractic Association, the International Chiropractic Association, the World Federation for Mental Health, the Alliance for Health Promotion, and many other organizations were also encouraged to provide critical input.

Buy-in and Organizational Adoption
Ninety-six Delphi panelists responded to the electronic Delphi consensus surveys. All slides achieved the requisite 75% approval criterion with a mean approval rating of 94.5% on the initial round of voting. The highest approval rating (98%) was also the modal score (5 slides out of 11 achieved this rating). The lowest approval rating was 87%. These approval ratings suggest a high level of core agreement with the basic intent of the walking module. Panelists made straight-forward stylistic recommendations such as reducing PowerPoint slide verbiage or splitting longer sections of walking instructions to enhance slide presentation, formatting and clarity.

A large number of decision makers of national and global health organizations participated in the Delphi process. Many indicated strong support for the walking module to promote activity and have included —Just Start Walking—on their websites (World Federation of Chiropractic, 2012). The Chiropractic Association of Australia has developed an excellent interactive website promoting walking for spinal health and well-being (Chiropractic Association of Australia, 2012).

Conclusions
Numerous studies indicate that walking has multiple beneficial effects on the health of individuals’ spines, joints, bones, hearts, lungs, brains, and immune systems (Abenhaim, Rossignol, Valat, et al. 2000), (Lee & Buchner, 2008), (Hakim, Curb, Petrovitch, et al., 1999), (Kramer, Erickson, & Colcombe, 2006), (Weuve, Kang, Manson, et al., 2004).

“Just Start Walking”, a physical activity module created, developed, and refined through this Delphi process, holds considerable promise as an evidence-based health promotion tool. If the chiropractic profession were to enthusiastically support and implement this effort widely, global health could benefit. Use of this program may also extend the reach of the previously-available spinal health promotion tool, —Straighten Up— (British Chiropractors Association, New Zealand Chiropractic Association, 2012).
References


Websites:
CAA – Just Start Walking
WFC, NZCA, BCA – Straighten Up
The Evaluation of Lumbar Multifidus Function via Palpation: Reliability and Validity of a New Clinical Test

Jeffrey J. Hebert DC, PhD, Shane L. Koppenhaver PT, PhD et al.

Murdoch University, Australia

Introduction:
Pathoanatomic approaches for the diagnosis for patients with low back pain have consistently failed to establish relationships between pathology and symptoms.1,2 An alternate approach emphasizes the assessment of function. The lumbar multifidus muscle provides an important contribution to lumbar spine stability3-7 and deficits in lumbar multifidus function are associated with low back pain.8-10 Moreover, improved lumbar multifidus function is associated with a better clinical outcome following spinal manipulation11,12 and the restoration of lumbar multifidus function is a frequent goal of rehabilitation.13,14 Currently, there are no reliable and valid physical examination procedures available to assess lumbar multifidus function among patients with low back pain. A simple procedure yielding reliable and accurate information about lumbar multifidus function may assist clinicians when assessing patients with low back pain.13,15 The purpose of this study was to examine the interrater reliability and concurrent validity of the multifidus lift test (MLT) to identify lumbar multifidus dysfunction amongst patients with low back pain.

Methods:
A cross-sectional analysis of reliability and concurrent validity performed in a university outpatient clinical research facility. We recruited participants between the ages of 18 to 60 years, with current low back pain and a minimum modified Oswestry disability score of 20/100. Participants were excluded if they had neurogenic pain, “red flags” indicating a serious condition, or a history of lumbar spine surgery. The reference (i.e., criterion) test involved ultrasound imaging measures of lumbar multifidus thickness at rest and during a prone contralateral arm lift.16,17 This technique has been demonstrated to be a reliable18 and valid19 functional assessment of lumbar multifidus. The MLT replicated the contralateral arm lift procedure while the examiner palpated the change in lumbar multifidus thickness occurring between resting and contracted states and made a qualitative judgement of normal or abnormal. We operationally defined a normal contraction as one in which a robust and obvious muscle contraction could be palpated during the arm lift. We operationally defined an abnormal contraction as occurring when there was little or no palpable contraction of the muscle during the arm lift. To examine its interrater reliability, the MLT was repeated on the same day by two examiners blinded to the others’ result as well as the reference test outcome. Kappa coefficients were used to examine the interrater reliability of MLT outcomes. The concurrent validity of the MLT was examined using point biserial correlation coefficients between the MLT and the index test outcome.
Results:
Thirty-two participants (44% female) were selected. The participants’ characteristics [mean (standard deviation)] were as follows: age = 31.4 (12.7) y, BMI = 25.8 (5.5), Oswestry disability score = 30.3 (11.0). The interrater reliability of the multifidus lift test was substantial to excellent (K = 0.75 to 0.81, p ≤0.01). When performed at L4/L5, the multifidus lift test demonstrated evidence of concurrent validity through its relationship with the reference standard results at both L4/L5 and L5/S1 (rpbis = 0.47 to 0.58, p ≤0.01). When performed at L5/S1, the multifidus lift test generally failed to demonstrate a relationship with the reference standard.

Conclusions:
When performed at the L4/L5 level, the MLT provides a reliable and valid assessment of lumbar multifidus function at L4/L5 and L5/S1. Additional research examining the tests’ responsiveness should be undertaken prior to confident implementation of the MLT with patients.

References


The Chiropractic Care of Children in Europe: Results from a Practice-Based Research Network

Joel Alcantara DC

Life West University, USA

Abstract

Background

The increasing frequency on the use of CAM therapies worldwide is well documented, particularly in industrialized countries (1-5). Commensurate with CAM’s popularity is the globalization of chiropractic. Research has demonstrated that CAM use by children is predicated upon CAM-use by their parents (1, 6). Of the various practitioner-based CAM therapies for children, chiropractic is the most popular (1). Previous studies characterizing the chiropractic care of children thus far indicate that children present for chiropractic care for morbidities commonly associated with children that span both musculoskeletal (MSK) and non-MSK conditions (7, 8).

The heterogeneity in the cultural, social/traditional, governmental and regulatory factors that influence the practice of chiropractic and the care of children has been acknowledged (9). No more is this true than in the European countries where specific legislation characterizes chiropractic practice in such countries as Denmark, Sweden, Switzerland and the United Kingdom while in others it regulated under common law or under de facto local regulations, administrative rules, or court-stated guidelines (10). We performed this exploratory study in a European chiropractic practice-based research network to characterize pediatric chiropractic.

Methods

This study was approved by the Institutional Review Board of Life University (Marietta, GA, USA). Doctors of Chiropractic in Europe were invited to participate in a practice-based observational research study to characterize the chiropractic care of children. Inclusion criteria for practitioner PBRN participation include: (1) practitioner in good standing with the appropriate oversight; (2) agree to the terms of PBRN participation (i.e., complete a National Institute of Health course on the Protection of Human Subjects and (3) be involved in pediatric care. Consent was obtained from all parent participants.

Results

A convenience sample of 14 chiropractors (10 females; 4 males) participated in this study. Their average age was 39.36 years with practice experience averaging 11.00 years. On average, these chiropractors attended to the care of 142 patients per week with an average of 18 patient visits per week comprised of children. In terms of compensation, the majority of the pediatric visits (85%) were paid for out-of-pocket while the remaining was paid by some form of insurance. In terms of their formal training, the majority (N=8) graduated from an American College while 3 graduated
from Australia and 2 from Great Britain. The majority (N=5) obtained a bachelor’s degree prior to chiropractic school with some attaining a Master’s (N=3) and doctorate (N=3) degrees. In terms of post-graduate training, the majority received specialized training with 9 receiving a certification and 2 a Master’s degree in pediatric chiropractic care. The practice environment involved multi-disciplinary (N=4), multi-DC (N=6) and solo (N=4) practices. In terms of their care approach, all indicated spinal manipulative therapy as their primary approach to patient care.

When asked regarding their referrals to and from medical physicians and other practitioners, 3 indicated “often” receiving referrals from MDs while 13 indicated “often” referring patients to MDs and 11 to other non-MD healthcare providers. Within the past month during the survey, 3 DCs indicated referring to MDs while 1 DC indicated referring to an emergency care facility due to the severity of their patient’s presenting complaint. Spinal manipulative therapy was indicated by the practitioners as the primary mode of care while in terms of adjunctive therapies, 10 indicated that exercise & rehabilitation as well as nutrition were important aspects of their practice while 13 indicated that herbal remedies were not.

A convenience sample of 64 parents reported on similarly numbered children (34 females; 30 males) for this study. The children’s median age was 7.38 years and were presenting with complaints having duration, on average, of 1.42 years. The presenting complaints indicated were mostly MSK in nature (N=15) including scoliosis (N=6) and torticollis (N=2) followed by wellness care (N=20), otolaryngological disorders (N=5), neurodevelopmental disabilities (N=3), and others (N=8). Of the 64 children, less than 47% (N=30) were indicated as previously attending the care of a medical doctor prior to seeking chiropractic care. Of these, 12 children required visits to the emergency department due to the severity of their complaint. The majority of children (53%; N=34) were presented by their parents to the chiropractor as a first line approach to patient care.

When inquired about the effectiveness of the care their child received using a Likert Scale, (1=strongly agree; 5 strongly disagree), 46 (72%) strongly agreed/agreed that chiropractic was effective in addressing their child’s presenting complaint while the remainder of the parent responders (28%; N=18) indicated a “Neutral/Don’t Know” response.

**Discussion**

Our findings demonstrated that European chiropractors involved in the chiropractic care of children share similarities with respect to their gender, age and practice experience (7.8.11). Most were trained in the United States which is not surprising given the number of educational institutions training chiropractors in that country. The majority of pediatric patient visits were funded out-of-pocket. With respect to collaborative care, our responder practitioners refer to medical physicians and other alternative practitioners. The nature of these referrals remain to be further characterized. Spinal manipulative therapy was the indicated primary mode of treatment while exercise & rehabilitation and nutritional intervention were commonly utilized with adjunctive therapies. This approach to patients care is consistent with previous findings (7-8, 11).
With respect to the motivating factors or presenting complaints for chiropractic care, we found MSK conditions and for health promotion and increased quality of life as the common motivators. These are similar to previous studies examining chiropractic pediatric patients in particular (8, 11, 12-14) and pediatric CAM-users in general (15, 16). In terms of perceived effectiveness, the majority of our parent responders (72%) assessed chiropractic for their child as being effective.

Conclusion
In the first PBRN characterization of pediatric chiropractic in Europe, parents present their children to chiropractors to address chronic conditions and to promote health and wellbeing. Furthermore, parents indicated a high perceived effectiveness in the care their child received. We support further research to characterize the safety and effectiveness of the chiropractic care of children.

References
Translating Evidence into Practice in a Chiropractic Setting: Improving Care through Better Understanding of Current Practice

Simon French DC, Melanie Charity DC, et al.

University of Melbourne, Australia

Introduction

Very little is known about who seeks chiropractic care, why people seek this care and what care chiropractors provide. An understanding of current chiropractic practice and evidence-practice gaps, that is, where practice is not consistent with evidence-based practice, would direct knowledge translation activities. In Australia the well established Bettering the Evaluation And Care of Health (BEACH) project is a continuous national study of general medical practice activity [Britt 2011]. COAST (Chiropractic Observational and Analysis StuStudy) used BEACH methodology in a chiropractic setting to describe the practices of chiropractors in Victoria, Australia.

Methods

This was a cross sectional study. Practising chiropractors in Victoria, Australia, were randomly selected from the Victorian Chiropractors Registration Board and invited to participate (n=156). Participating chiropractors documented their management of up to 100 consecutive patients over a four week period. For each chiropractic-patient encounter, information collected included: patient health profile, patient reasons for encounter, problem/diagnosis, and chiropractic care delivered. Information entered by chiropractors were coded, where possible, in more specific terms to the International Classification of Primary Care (ICPC-2 PLUS) [WICC 1998]. Ethics approval was received from the University of Melbourne Human Research Ethics Committee.

Results

Seventy two chiropractors agreed to participate in the study (46% response rate). Twenty of these chiropractors (28%) dropped out of the study (9 no reason given; 7 time pressures; 3 personal reasons; 1 primarily non-English speaking patients). Fifty two chiropractors completed the study providing information about 4,464 chiropractic-patient encounters. Chiropractor characteristics: Female chiropractors made up 27% of participating chiropractors and their average age was 42 (range 24-64). Average years in practice was 16 (range 1-39), 85% graduated from an Australian chiropractic institution and the average number of patients seen per week was 87 (range 13-220). The average duration of encounters was 17 minutes. Chiropractors who participated in COAST were similar to the Victorian chiropractic population for years in practice and proportion in a rural location, however the COAST participants had a lower proportion of female chiropractors (27% versus 38% in Victoria). Patient/client characteristics: In the majority (79%) of the chiropractic-patient encounters, people seen were between the ages of 25-64; only 1% of encounters were for infants less than 1 year (95%CI 0.3, 3). In 56% (95%C: 53, 59) of the encounters patients were female. In only 6% (95%C: 5, 8) of
encounters patients had not been seen previously. In 81% (95%CI: 76, 86) of encounters, patients paid directly for the chiropractic service. The patient’s Reason For Encounter (RFE) was musculoskeletal-related in 60 out of every 100 encounters (95%CI 54, 67). In 39 out of every 100 encounters (95%CI 33, 47) the RFE was for maintenance/wellness or check-up. Encounter characteristics: In 62 out of every 100 encounters (95%CI 55, 71) the problem managed was a spinal problem (including most commonly “subluxation” and “joint dysfunction”). The most frequent care provided by the chiropractors were manual adjustments and soft tissue therapy.

Discussion and Conclusion
COAST provides a robust method to measure the activity of chiropractic practice. A range of conditions are managed by chiropractors in Victoria, Australia, but most commonly these conditions are musculoskeletal-related. This information is important for the chiropractic profession and its stakeholders to understand who seeks chiropractic care, for what reasons and what care chiropractors provide. This information can also be used to identify evidence-practice gaps and areas of practice ripe for implementation and practice change in order to improve health outcomes for the people who seek chiropractic care.

References

Producing New Graduates who can cope in Traditional Clinical Environments

Background Paper (1)
Deborah Kopansky-Giles DC
Canadian Memorial Chiropractic College, Canada
Max Sully DC
Murdoch University, Australia

BMC Complementary and Alternative Medicine
Research article

Integrative Medicine: A Tale of Two Clinics
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Abstract
Background: Integrative medicine (blending the best of complementary and alternative medicine (CAM) with conventional medicine) is becoming increasingly popular.

Objectives: The objectives of this paper are to compare and contrast the development of two teams that set out to establish integrative medical clinics, highlighting key issues found to be common to both settings, and to identify factors that appear to be necessary for integration to occur.

Methods: At St Michael's Hospital (an inner-city teaching hospital in Toronto, Canada), a total of 42 interviews were conducted between February 2004 and August 2006 with 18 key participants (4 administrators, 2 chiropractors, 2 physiotherapists and 10 family physicians). At the CARE (Complementary and Alternative Research and Education) Program at Stollery Children's Hospital, Edmonton, Canada, 44 interviews were
conducted with 24 people on four occasions: June 2004, March 2005, November 2006, and June 2007. Basic content analysis was used to identify the key themes from the transcribed interviews.

**Results:** Despite the contextual differences between the two programs, a striking number of similar themes emerged from the data. The five most important shared themes were: 1) the necessity of "champions" and institutional facilitators to conceive of, advocate for, and bring the programs to fruition; 2) the credibility of these champions and facilitators (and the credibility of the program being established) was key to the acceptance and growth of the program in each setting; 3) the ability to find the "right" practitioners and staff to establish the integrative team was crucial to each program's ultimate success; 4) the importance of trust (both the trustworthiness of the developing program as well as the trust that developed between the practitioners in the integrative team); and 5) the challenge of finding physical space to house the programs.

**Conclusion:** The programs were ultimately successful because of the credibility of the champions, institutional facilitators and the staff members. Selection of excellent clinicians who were able to work well as a team facilitated the establishment of trust both within the team itself as well as between the team and the host institution.
Background

"It was the best of times, it was the worst of times..." [1] Charles Dickens had never heard of integrative medicine when he wrote the opening line to his classic text, but it fittingly describes the conundrum in which integrative medicine clinicians find themselves today. [2,3] There is increasing evidence that both patients and clinicians see integrative medicine as the best way to provide optimal health care. [2,4] Yet, a definition of what constitutes integrative medicine remains elusive. [5,6] which makes it difficult to determine who is (and who isn't) practicing it. Integration can occur at a variety of different levels: from patients who combine various therapies to practitioners who practice different modalities, clinics that offer a range of therapies, and health care systems that facilitate the use of multiple treatment options. [7] Dalen describes integrative medicine as both high-tech and high-touch medicine and argues that dual trained physicians are ideally placed to make this happen. [2] Others focus on the interdisciplinary nature of integrative medicine. [5,8] For the purposes of this paper, integrative medicine is defined as the interdisciplinary blending of conventional medicine and CAM with the purpose of enhancing patients' health.

Many authors have attempted to identify factors related to successful integration of CAM and conventional medicine. For example, Hsiao et al.'s interviews with a wide range of practitioners show that successful integration is related to provider attitudes toward integrative medicine, knowledge of integrative medicine, readiness to refer to other practitioners and ability of clinicians to practice more than a single modality. [6] This work highlights the multi-dimensional nature of the concept of integrative medicine, provides a conceptual model that links provider characteristics with provider behaviors and shows how they appear to be mediated by provider attitudes and knowledge. [6].

There are also a number of critiques that the type of medicine being practiced by those claiming to provide "integrative medicine" are not in actuality integrated according to many definitions of the concept. [5,9] For example, Hollenberg describes the exclusionary and demarcationary closure strategies of conventional medicine practitioners in two integrative medicine clinics. Hollenberg argues that even while striving to collaborate with their CAM colleagues, conventional medicine practitioners in these clinics continue to perpetuate patterns of conventional medicine dominance by maintaining control of overall patient care and using conventional medicine language as the primary form of communication throughout the clinics. Hollenberg also describes how the CAM practitioners in the clinics employ usurpationary closure strategies by evoking their own specialized forms of knowledge and referring among themselves to increase patient flow among the CAM practitioners. [9] Lim et al. argue that most definitions of integrative medicine describe an ideal goal as opposed to a functioning program [5].

There is an increasing number of accounts of integrative medicine program developments in the literature. [1.0,14] These generally provide guidance for others planning similar projects. A brief review of these reports identifies similar success factors including open-minded attitudes of administrators at host institutions, indicating an open-minded institutional culture. [10,13] Highly competent CAM and conventional medicine practitioners [1.0,11] effective communication among team members [9,13] sustainable environment [10,12] complex [10,13] and ability to fit unique needs of constituents. [10,13] The objective of this paper is to compare and contrast the development of two teams that set out to establish integrative medical clinics. Despite the clinics' obvious differences (one setting chiropractors were integrated into the family medicine outpatient service of a large inner city teaching hospital, in the other, a pediatric consultation service was established in a large pediatric hospital along with CAM research and education programs) there were many success factors that were similar across both programs. Thus, in this paper we not only seek to confirm the findings of earlier studies, but also to begin the process of identifying factors that are necessary for integration to occur. This paper will highlight key issues found to be common to both integrative medicine initiatives, and likely common to most integrative programs.

Methods

In this paper we compare the findings from two different applied ethnographies [16,17] of integrative medicine programs at St. Michael's Hospital (SMH) in inner-city Toronto, Ontario, Canada and the CARE (Complementary and Alternative Research and Education) Program at Stollery Children's Hospital Edmonton, Alberta, Canada. An applied ethnography employs fieldwork including observation, key informant interviews and an analysis of documents to focus on a single practical issue. [1.6] In this case, the focus was on understanding what makes an evolving integrative medical team successful. In each site, a series of semi-structured interviews with a range of participants (clinicians, support staff, hospital administrators) were conducted over a period of several years. In addition, the researchers observed team meetings, retreats and interactions as well as clinic operation at several stages throughout the data collection period.

At SMH, a total of 42 interviews were conducted between February 2004 and August 2006 with 18 key participants (4 administrators, 2 chiropractors, 2 physiotherapists and 10 family physicians). All participants were interviewed at
least twice, with the exception of two administrators and three family physicians who were only interviewed once. All interviews included questions about perceptions of, and involvement in, the integration of chiropractic services at SMH. At CARE, 44 interviews were conducted with 24 people on four occasions: June 2004, March 2005, November 2006, and June 2007. Five participants were interviewed only once due to staff turnover. Eighteen participants were interviewed 2–3 times. Only 1 participant was interviewed at all four visits. During the interview, the participants were asked to reflect on their experience of working in the CARE program specifically, what seemed to be working well, what was not working, and what had changed since the authors’ previous visit.

All interviews were audio recorded and transcribed verbatim. The initial 10 interviews at each site were coded individually by both authors using basic content analysis [18–20] to identify key themes. Transcripts were then entered into the qualitative software program NVivo 2.0 for further analysis. [21] Data from each site were collected and analyzed separately. Only when it became clear that there were many similar themes arising from the two data sets was the idea for this comparative paper formulated.

Results

Both programs described themselves as providing integrative medicine by which they meant combining CAM and conventional medicine therapies in an evidence-based approach to providing patient care. For instance, one of the stated goals of the CARE program was to:

...create a supportive and collaborative environment where conventional health care providers, CAM practitioners, and trainees can investigate and learn about CAM therapies and products from a rigorous evidence-based perspective [22].

Similarly, one of the SMH program’s progress reports described the project as the creation of:

... an integrative model of care within the Department of Family and Community Medicine, with the inclusion of chiropractic services. The project team created an ongoing working group that described practitioners’ scopes of practice, developed referral protocol, created reporting and communication mechanisms and supported a patient-centered, evidence based approach to care delivery [23].

The programs both embraced Sackett et al.’s definition of evidence-based medicine being the “integration of the best research evidence with clinical expertise and patient values,” (p. 1)[24].

CARE was the larger and more complex of the two programs. It consists of four main “arms”: clinical, administrative, research, and education and currently includes more than 35 full and part-time staff members, such as a naturopathic doctor, a traditional Chinese medicine practitioner, and a massage therapist. Situated in a large academic pediatric hospital, the research and administrative arms were the first to develop, followed closely by the education arm. The clinical arm, which is the focus of this paper, was the last to develop largely because of myriad logistical issues associated with hiring and credentialing CAM practitioners to work in an academic medical centre. The CARE integrated medicine clinic began as a referral-based, pediatric out-patient consultation service.

As it now operates, patients (and their families) referred by pediatricians are interviewed by a CARE paediatrician as well as a range of CAM providers based on patients’ questions, concerns and interests. Patient cases are then discussed by the relevant CARE CAM and conventional practitioners, as well as team support staff and information specialists. Following this process, integrative consult letters summarizing what is known about the safety and efficacy of CAM therapeutic options for each individual patient are drafted. Although CARE is limited to pediatric consults, it is not limited in terms of the conditions with which patients present. At the time this is written, assessments are done by CAM providers in the CARE clinic as part of the patient’s assessment; however, provision of CAM therapies is conducted off-site in practitioners’ private offices.

In contrast, the SMH integrative medicine team consists of only one type of CAM provider (chiropractors) who were integrated into an existing family medicine outpatient clinic at a large inner-city academic hospital that included family physicians, nurses, physiotherapists, social workers, dieticians, occupational therapists and pharmacists. In this case, two chiropractors joined a team of two physiotherapists and 45 physicians. Currently, both the chiropractors and the physiotherapists provide on-site treatment and follow-up of adult patients referred by clinic physicians. The physiotherapists and the chiropractors have separate treatment rooms in the same office, but the physicians and other providers are located in four clinical settings set within 5 km of the hospital.

Despite the obvious contextual differences in the two programs, a striking number of similar themes emerged from the data. The five most important shared themes were: 1) the necessity of “champions” and institutional facilitators to conceive of, advocate for, and bring the programs to fruition; 2) the credibility of these champions and facilitators (and the credibility of the program being established) was key to the acceptance and growth of the program in
each setting; 3) the ability to find the "right" practitioners and staff to establish the integrative teams was crucial to each program's ultimate success; 4) the importance of trust (both the trustworthiness of the developing program as well as the trust that developed between the practitioners and senior administration in the host institutions); and 5) the challenge of finding physical space to house the programs. Each theme is discussed in greater detail below.

Champions
Many respondents highlighted the importance of key players who championed these programs. There was widespread agreement across participants that without these champions, neither the CARE nor the SMH program would exist. In the case of both programs, one or more facilitator(s) within the host institution were required in order to gain funding, space and approval for the programs. These facilitators were aided by key "champions" who became visible leaders of the programs. In both programs studied, the key champion happened to be a dynamic woman who had been working toward the development of the integrative medicine program for many years. In one setting, the champion was a physician working from "inside" the conventional medicine system. In contrast, the champion at the other site was a CAM provider. In both cases, the champion provided the passion and energy to make the integrative service happen with help of the facilitators:

"It helps to have a strong advocate and a champion who keeps pushing because it keeps it on the agenda. (CARE, June 2004)"

"Champion] was very, very effective in advocating with the [provincial ministry of health] and using her relationship with people at the Ministry to push that forward...I think [Champion] was extremely effective with her strategy. (Admin 1, SMH)"

"There are a lot of people who are interested...but I think having an interested alone is not going to be enough to get a clinic up and running. You need someone to champion it, and who has knowledge as well as the motivation. And we have that. (CARE, March 2005)"

The champions, aided by the institutional facilitators, spent a great deal of time and energy laying the groundwork for the CARE and SMH programs within their respective institutions. This groundwork was instrumental in preparing clinicians and administrators at all levels of each home institution (and in the case of CARE, the regional health authority) to ensure that the integrative medicine program would be able to survive and thrive once it was introduced. Given the scarcity of resources and the range of opinions (and, in many cases, negative biases) about CAM therapies in general, it was essential that the champions and institutional facilitators were diligent in laying this groundwork prior to the initiation of the integrative medicine programs. This preliminary work made it clear that the programs were supported by senior level administration and physicians throughout the conventional medicine organization, which in turn sent the message to other clinicians throughout the institutions that these programs were safe, legitimate options for providing care for patients.
It's important with any new service. We need to pave the way, we need to market it. We need to send positive messages to the potential referral services. Physicians and family physicians tend to be somewhat conservative about where they're going to send their patients. They're protective, and they're not just going to send them anywhere. So they want to know that it's supported and endorsed and has credibility and it's going to be a safe service. And also again sending the message that senior levels of program administration supported it and had confidence in it... (Admin2, SMH)

We've also done a survey of all the divisions, like everyone who's a member of the Department of Pediatrics. That was to find out who was going to be sending patients to us. Because we wanted to be able to prepare in advance for what their clinical needs will be. So the clinicians have an understanding that there is a need, they have a need for this knowledge, their patients have a need for this knowledge, they would like to have a place that they could send patients. It was a lot of work up front, but it's paid off. (CARE, June 2004)

Credibility and Trust
Participants interviewed for both projects explained how acquiring credibility within the host institutions was crucial to the success of the programs. For example, the SMH project had to overcome a history of distrust and, in some cases animosity, between chiropractors and physicians. [25-28] Physicians in the SMH family medicine clinic in particular had to be convinced that this was a safe, reliable service. The reputations of both the champion and the chiropractors chosen to work in the clinic lent credibility to the existence of the program and seemed to make the physicians interviewed comfortable referring to the service.

I know their names, I know who they are, I know they're good and well trained, that makes it [referring to the service] a little easier. (Health Care Professional (HCP)6 SMH)

I think that having a reliable, credible source is very important. It's the same with anything. I don't refer to all the gastroenterologists in the city either, right. So having a reliable, quality source that's actually in the hospital and in the hospital context makes a huge difference. So I would refer to every chiropractor in the city the same way. No. I don't refer to every doctor in the city the same way. (HCP9 SMH)

One of the key ways the SMH program built credibility and trust among the physicians of the host institution was by voluntarily limiting the scope of chiropractic practice to musculoskeletal complaints for which there existed a basis in scientific evidence. In addition, the chiropractors' practices were limited to referrals from physicians in the family practice unit and two other units in the hospital. Thus patients treated by the chiropractors were initially screened by physicians. These restrictions on the normal practice of chiropractic were key to creating the level of comfort necessary to initiate the chiropractic service; however, it was the competence and skill of the chiropractors working in the service that led to high levels of trust as the program evolved over time.

It's hard to know who to send your patients to. You don't always know if can trust the person you're sending your patient to, but in this case, we don't have this problem. (HCP2, SMH)

CARE program members also identified establishing credibility for the program as being key to the program's success. One of the big challenges for CARE was that fact that they were a pediatric service and thus had to deal with the fact that there was relatively little scientific evidence about the safety or efficacy of most CAM therapies for children. Further, CARE members were conscious of the fact that their very existence might be seen as supportive of all CAM therapies. Respondents were clear in their assertion that, in order to achieve credibility, they were striving to provide a service that is based on what evidence does exist combined with the extensive clinical experience of their team. The team also had a stated focus on collecting data to generate evidence to facilitate recommendations for future patients.

I think the fact that we are here in an academic setting gives the sceptics a little bit of comfort and sends the message that probably it is a safe program... It gives us credibility. (CARE, March 2005)

We include CAM providers, we listen to what they say, we respect them, we've created a home where they could be part of the team. That's in its very essence a form of advocacy because the system before didn't have room for that... we do what we say we do, which is to walk that really difficult path down the middle because sometimes the evidence comes out against a particular (CAM) therapy and then we need to say so. And sometimes it comes out in favour of us and we need to say that too. (CARE, June 2007)

CARE also began by limiting the service they provided to consultation services. No CAM therapies were provided by the CAM practitioners of the CARE team; instead, they offered their expert clinical opinions to help inform what treatment options might be helpful. In addition, although the CARE team was composed of a wide variety of practitioners, it did not include a chiropractor due to the historical concerns and political controversy surrounding...
chiropractic treatment for children. [29] Thus, like the SMH program, the CARE team began with limited services that were later expanded as trust that the CARE practitioners could deliver evidence-based CAM increased within the host institutions increased:

I think doing this research in an academic setting... gives credibility to a field that some perceive to be soft and fluffy. And so it brings science and a language of science, questioning, using evidence, and having hypotheses and so on to the use of CAM, which has helped us expand our scope within this setting. (CARE, 2007)

Staff: finding the "right fit"
Participants interviewed from both teams stressed the importance of finding exactly the right kind of staff. For both programs, choosing staff was not always an easy task. The "right" people had to have very strong clinical qualifications, but also be able to participate and enhance the team as a whole:

For instance, we do the 'tell us about a time you had a difference with a colleague and how you resolved it'—the question that everybody gets in every job interview. But I think it's an important question because it's a fact of life and you can tell when people answer that question if it sounds rehearsed or not. What we want is for them to come up with something really specific like 'I just didn't see eye to eye with my director on this, and we just couldn't resolve it and then I just decided that I was going to write out my piece and solve it creatively'—that's one of the things that we were looking for. This direct honesty, face to face honesty. That's when we know we have a good fit. (CARE, June 2007)

And from the first time I met them I found both (chiro) very friendly and open and not defensive and not pushy, just very collaborative. Aims to make this project work and be very positive about it, but very respectful of the fact that many people here probably were not very familiar with chiropractic. I think also the fact that they are both very experienced chiropractors helped, and on staff on the [chiropractic college], because as a person myself who knew relatively little about chiropractic in the past, I could relax about their clinical competence. I didn't have to worry about that at all, whereas somebody who was much younger and on a learning curve in their practice, not only in terms of the techniques and treatment things of chiropractic but also with dealing with difficult patients. So these individuals as choices of staff for the program was obviously a hugely important consideration. I don't know how we would be doing without them. (Admin3, SMH)

Space
Finding space for both programs within the larger institutions was a huge issue for both initiatives. With the SMH program, the chiropractors were promised a renovated space containing two treatment rooms and a rehabilitation gym. This renovation did not get underway until more than halfway through the time allotted to the research phase of the program. While this problem was ultimately solved, space issues continued to be a factor throughout most of the pilot period and definitely slowed the development of the program:

I think one of our major limitations is going to be that we don't have enough space... and that's limited like how much patient volume we can see and our ability to practice more efficiently. Right now, I have an office on another floor and I have to run up the stairs to work on my computer and then run downstairs to see my patients. It's very limiting. (HCP2, SMH)

We call 'space' the five-letter word! (Admin1, SMH)

Similarly, in the case of CARE, space was identified as one of few, and most significant, barriers to the growth of the program:

So what are our barriers right now? I'd say the first is space: physical space. I had not anticipated this... We have had such rapid expansion that finding physical space to put people: where will their desk be? Where is their computer? Do they have a phone? [These] are issues that you don't need that when you only have an idea. But suddenly when that becomes a reality, these people need staff. So finding them a physical home has been really, really difficult. (CARE, June 2004)

Discussion and Conclusion
Perhaps the most interesting finding to emerge from these data was the high degree of similarity between the themes associated with each program. Both programs have been successful at integrating the services of CAM and conventional medicine providers on many levels. They continue to struggle with some of the factors previously identified in the literature, including communication among team members, which in both cases is exacerbated by the large number of part-time staff, and challenges finding appropriate space where the entire team can be housed together. The preponderance of part-time practitioners is partially driven by economic incentives and is related to the fact that this study tracked two integrative medicine programs from their inception. Both continue to evolve and expand, and it is likely that the number of full-time team members will increase and space issues will be more permanently resolved as the programs mature.
Our results suggest that a highly respected champion is necessary for the development of a new integrative medicine program. Both these programs were highly dependent on the efforts of champions with visions who were able to mobilize a wide range of individuals at many different levels within the health care system in order to facilitate the actualization of these integrative medicine programs. Previously, Vohra et al. identified the necessity of a "motivated champion" to initiate an integrative medical centre. [13] However, there has been little discussion of role or characteristics of such a champion prior to this study. Our findings clearly show that the champion can be either a CAM provider or a conventional medicine provider. What is most important is that the champion has credibility within the host institution, as well as with patients and clinicians who will work together in the integrative medicine program. The champion is not necessarily the primary administrative or clinical leader of the subsequent program, but usually maintains some kind of leadership role, at least for the birth and early development of the program. Our results lead to two new research questions: 1) can an integrative medicine program evolve without a champion? And 2) what happens to integrative medicine programs when their champion leaves – can they survive?

The findings of this study highlight another necessary factor for new academic integrative medicine programs. Both evolving clinics were flexible in implementing their visions to address issues and concerns related to their unique contexts. CARE began with only a consult service and to date does not include a chiropractor among the team members despite the high use of chiropractic among children. [30] Similarly, the chiropractors in the SMH clinic began by explicitly limiting their legally-defined wide scope of practice to musculoskeletal conditions. However, as referrals and comfort levels increased over time, the SMH chiropractors have seen a wider range of referrals and increasingly have been asked to provide "second opinion" level service when their physicians are unsure of the diagnosis (ie, because of diagnostic uncertainty, they will defer the diagnostic opinion to the chiropractors). This suggests an evolution in the physicians' level of trust and confidence towards the chiropractors. [31] In both settings, the CAM providers were being integrated into conventional medicine contexts and as such, there was a degree of conventional medicine dominance created by the existing structures as has been described previously. [9,32-34] In both clinics, the CAM providers were required to initially limit the scope of their activities in order to gain access to the integrative setting.

In both settings, it appeared that time was needed to establish the level of trust necessary to fully integrate the CAM services into the host institutions. This was facilitated by the demonstrated competency of the CAM providers and highlights how important the choice of these individuals was in each instance. Launso identifies a range of competencies that facilitate integrative team work including: the ability to "think as a team", including the ability to cooperate, openness to working together, respectful attitude toward others and willingness to solve tasks as a group. [11] These were all highlighted in our findings as the participants described how they identified practitioners that would be a "good fit" for their teams. Although these personal characteristics and attitudes were vital to aid the growing collaborative nature of the teams, perhaps the most fundamental characteristic of all team members was their excellent clinical skills in their home discipline. These clinical skills helped build the credibility of the team as a whole and may have contributed to building trust among the integrative medicine team members.

Like all research projects, this study has limitations. Data from only two clinics are compared. However the high degree of similarity among the key themes despite the large differences in context suggests that study of other teams will not add many additional themes. Both integrative medicine clinics were followed from their inception to stable functioning; however, it is not possible to infer the long term success of either program at this time and thus, we cannot be sure the common themes we describe are in fact "success" factors.

Despite the wide contextual difference in the two clinical settings under study, there was a large overlap in the key characteristics of these integrative medicine programs which have allowed them to succeed so far. Our data suggest that champions with vision and energy supported by institutional facilitators who were able to mobilize a range of others are necessary to establish an integrative medical program. The programs arose in host institutions (St. Michael's Hospital and The Stollery Children's Hospital/University of Alberta) that were open to trying new care delivery programs, as is evidenced by the very fact that these programs were allowed to become firmly established and thrive within their walls. The programs were ultimately successful because of the credibility of both the champions, facilitators and the staff members. Selection of excellent clinicians who were able to work well as a team facilitated the establishment of trust both within the team members as well as between the team and the host institution.

**Abbreviations**

The abbreviations used in this article were: CAM: Complementary and alternative medicine; CARE: Complementary and Alternative Research and Education program; SMH: St. Michael's Hospital; and HCP: Health care practitioner.
Competing interests
The authors declare that they have no competing interests.

Authors’ contributions
HSB conceptualized the study, participated in data collection, analysis and interpretation, helped to draft the paper and approved the final manuscript. NK participated in data collection, analysis and interpretation, helped to draft the paper and approved the final manuscript.

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References
22. CARE Program [http://www.care.ualberta.ca].
23. Kopsany-Giles D. Integrating Chiropractic Health Care in a Primary Care, Hospital-Based Setting. Toronto: Final report to the Primary Health Care Transition Fund, Ontario Ministry of Health and Long Term Care 2006.
35. The Advanced Foods and Materials Network (AFMN) [http://www.ufc.ca].

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What is feedback in clinical education?

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OBJECTIVE Feedback is important in clinical education. However, the medical education literature provides no consensus definition of feedback. The aim of this study is to propose a consensus, research-based, operational definition of feedback in clinical education. An operational definition is needed for educational practice and teacher training, and for research into the effectiveness of different types of feedback.

METHODS A literature search about definitions of feedback was performed in general sources, meta-analyses and literature reviews in the social sciences and other fields. Feedback definitions given from 1995 to 2006 in the medical education literature are also reviewed.

RESULTS Three underlying concepts were found, defining feedback as 'information', as 'reaction', including information, and as a 'cycle', including both information and reaction. In most medical education and social science literature, feedback is usually conceptualised as information only. Comparison of feedback definitions in medical education reveals at least 9 different features. The following operational definition is proposed. Feedback is specific information about the comparison between a trainee’s observed performance and a standard, given with the intent to improve the trainee’s performance.

CONCLUSIONS Different conceptual representations and the use of different key features might be a cause for inconsistent definitions of feedback. The characteristics, strengths and weaknesses of this research-based operational definition are discussed.

KEYWORDS education; medical education; feedback; clinical medicine; education; teaching; feedback; meta-analysis; publication type.

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INTRODUCTION

Feedback is crucial in clinical learning situations, judging from the number of publications about feedback and related topics in medical education.1–3 Medical educators frequently believe that they give feedback to medical trainees, whereas trainees report that feedback is rare.4,5 To illustrate this, Sender-Lichten et al. found that, although 90% of attending surgeons reported they gave feedback successfully, only 17% of their residents agreed with this assertion.6 This illustrates the notion that agreement about the meaning of feedback is not evident. Clinical education is weakened when teachers, supervisors, students and trainees do not agree about the definition and use of feedback as an educational tool. In addition, research on effective feedback cannot be performed without agreement about what it means. A clear, operational definition of feedback is needed.

The idea of feedback has a long history. Feedback as a feature of medical teaching is discussed in the writings of Hippocrates and other prominent ancient Greek physicians.9 The concept of feedback is now used in many fields of science, including mathematics, engineering, social science, logic, biology and econometrics.10 The contemporary use of 'feedback' dates from the beginning of the 20th century. It was introduced in electronics in 1920, defined as: ‘The return of a fraction of the output signal from one stage of a circuit … to the input of the same or a preceding stage … tending to increase or decrease the amplification’.11 Electronic feedback
Overview

What is already known about this subject

Although feedback is seen as important, there is little consensus on its definition.

Definitions are important for theory building and distinguishing concepts from each other. Poorly defined concepts lead to misinterpretations in daily practice and research.

What this study adds

An overview is provided of conceptual and operational features of feedback definitions in social science and medical education. A consensus, research-based, operational definition is proposed.

Suggestions for further research

Further research might focus on the influence of weak and strong feedback according to the proposed definition, and influences on trainee perception and performance.

was later described in 1986 as: 'The effect whereby sound from a loudspeaker reaches a microphone and the speaker therebydistorting the sound and typically generating a screeching or humming noise.'

A social science definition of feedback was proposed in 1945 stating: '... feedback [signifies] that the behaviour of an object is controlled by the margin of error at which the object stands at a given time with reference to a relatively specific goal.' In this definition, feedback is viewed as a cycle that connects input and output. The cycle concept expanded over time and feedback in the social sciences also became 'information' and 'reaction.' The term 'feedback' is now used and interpreted in many different ways. There seems to be little consensus about its definition.

The aim of this report is to propose a research-based operational definition of feedback for learning situations in clinical education. To achieve this, we addressed 4 questions.

1 What is the most general conceptual formulation of feedback?

2 Which approaches to feedback are most commonly used in social sciences and medical education?

3 Which characteristics of feedback are commonly used in definitions about the learning process in medical education?

4 Which of these concepts and characteristics contribute most to an unambiguous description of feedback for clinical education?

METHODS

Questions 1 and 2 were investigated by literature searches, performed in general literature sources, in the social science literature, and specifically in the area of medical education (available from the author).

General literature

To determine general conceptual formulations of the term 'feedback', definitions were collected from dictionaries (n = 18), encyclopedias (n = 11), lexicons (n = 2) and handbooks (n = 5) pertaining to different scientific fields available in the library collection of Utrecht University.

Social science literature

Literature searches in the ERIC and PsycINFO databases were performed focusing on meta-analyses and literature reviews on feedback. To keep our search manageable, we excluded all other types of publications.

Medical education literature

Further searches in the ERIC, PsycINFO and MEDLINE databases focused on the term 'feedback' in a supervisor-learner situation in medical education.

Our search criteria required that feedback be a defining theme in journal articles, Medical Subject Headings (MeSH), thesaurus terms and titles of articles 'the shortest possible abstract.'

In order to ensure focus on its definition and meaning, 'feedback' was the only term used in the second and third search strategies. Other terms, including 'knowledge of results', 'reinforcement', 'reward', 'formative assessment' and 'appraisal' were dropped. Clear inclusion and exclusion criteria were listed and described to decide on feedback definitions.
The content of different definitions in the medical education literature was compared with feedback characteristics to answer the third question. An answer to the fourth question required synthesis and evaluation of the different concepts and elements to formulate an operational definition of feedback.

RESULTS

General conceptual formulation of feedback

A comparison of feedback definitions from 36 dictionaries, encyclopaedias, lexicons and other general sources in medicine, biology, music, linguistics, communications and social sciences programmes leads to multiple definitions of feedback. Three concepts dominate: feedback as information; feedback as a reaction where information is included, and feedback as a cycle, involving information and reaction. Table 1 gives examples of the 3 approaches.

Feedback as information has message content as its focus. Central to feedback as a reaction is interaction, a process of information delivery and reception. Feedback as a cycle includes both information and reaction features but also includes a consequence or outcome of the message (e.g. response improvement). In addition, feedback as information is discrete, whereas both the reaction and cycle formulations are processes.

Feedback definitions in social science

The social science literature search produced 133 reviews or meta-analyses. Articles on feedback within a 'learning' situation were found in the context of education (n = 82), clinical psychology or therapy (n = 21), and the workplace (n = 10). Most reviews describe written, oral, graphic or video forms of feedback to convey information about a performance. In addition, sensory feedback, biological feedback and auditory feedback were described in 2, 12 and 3 reports, respectively.

Authors used 4 different strategies to address defining feedback. Firstly, most do not define the term. Instead, they describe 1 or more characteristics of feedback such as its purpose, target, content, dimensions, type and source. Secondly, other writers do not specifically define feedback but refer to definitions of feedback from the literature and discuss their limitations. Thirdly, some define a derivative of feedback, for example feedback intervention and 360-degree feedback. A fourth group defines feedback explicitly. An overview of definitions is provided in Table 2. Feedback is mostly represented by the information concept (n = 8),

<table>
<thead>
<tr>
<th>Concept</th>
<th>Characteristic</th>
<th>Example of feedback definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>Focus is message content</td>
<td>Feedback is information on progress of teaching and learning provided through various methods of assessment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feedback is information provided to the learner concerning the correctness, appropriateness or accuracy.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In short feedback is information about a learner's performance.</td>
</tr>
<tr>
<td>Reaction</td>
<td>Focus is interaction with information</td>
<td>'The interchange of information on the part of human beings in a communication or problem-solving situation.'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>'A direct response by an individual or group to another person's behaviour, such as the reactions of an audience to a speaker's remark.'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>'In every instance, part of the output is fed back as new input to modify and improve the subsequent output of a system.'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>'Error correcting information returned to the control center of a servomechanism (or to the nervous system and brain of a living organism) enabling it to offset deviations in its course toward a particular goal.'</td>
</tr>
<tr>
<td>Cycle</td>
<td>Focus is receiving information,</td>
<td>Feedback is information on progress of teaching and learning provided through various methods of assessment.</td>
</tr>
<tr>
<td></td>
<td>responding to data, and improving</td>
<td>Feedback is information provided to the learner concerning the correctness, appropriateness or accuracy.</td>
</tr>
<tr>
<td></td>
<td>response quality</td>
<td>In short feedback is information about a learner's performance.</td>
</tr>
</tbody>
</table>
followed by reaction\(^{56-63}\) (n = 5), and cycle\(^{44-46}\) (n = 8). One definition combines these 3 concepts.\(^{49}\)

**Feedback definitions in medical education**

The focus in medical education literature is on feedback in a learning context, a situation in which 2 parties – a supervisor and trainee – aim to improve trainee knowledge and skills. We excluded articles that did not meet the criterion of a learning context based on titles and abstracts. Included were feedback interventions, guidelines about providing and receiving feedback, and perceptions of feedback.

**Concepts**

Feedback is mostly described as information (n = 7) and reaction (n = 4). Often (n = 8) authors cite or base their definition on an existing definition.\(^{46-50,56}\) Ende is cited twice, but differently.\(^{57}\) His article describes important elements in the feedback process but he does not explicitly define the term.

**Characteristics of feedback definitions**

Nine characteristics are evident when the definitions in Table 2 are compared. All definitions state which concept is used – information or reaction. In addition, information is included about some of the following characteristics:

1. **Content** of information that should be conveyed: cognitive, evaluative, or about a standard, results, effects, behavior, or the feedback recipient;

<table>
<thead>
<tr>
<th>Feedback definitions in the medical education learning context</th>
<th>Concept and characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Any information that is provided to the performer of any action about that performance&quot;(^{(50,59)})</td>
<td>Information [1,3]</td>
</tr>
<tr>
<td>&quot;Feedback is information about the result of a performance and this is often about a consultation and/or skill that has been performed by the learner and observed by the teacher&quot;(^{(52,69)})</td>
<td>Information [1,3,5,6]</td>
</tr>
<tr>
<td>&quot;[...] information from instructor to learners about their past performance on the wards which serve to enhance or modify future actions of learners [...]&quot;(^{(83,332,84)})</td>
<td>Information [1,2,7]</td>
</tr>
<tr>
<td>&quot;[...] information that gives learners knowledge of the results of their study and clinical work&quot;(^{(532,85)})</td>
<td>Information [1,2]</td>
</tr>
<tr>
<td>Formative feedback: 'Information about how successfully something has been or is being done'(^{(44,58)}) and is provided to help individuals improve their performance(^{(45,68)}) (p 66)</td>
<td>Information [1,2]</td>
</tr>
<tr>
<td>Feedback is defined as specific information presented to a learner to promote reflection on performance. It focuses on both what was done and what the consequences of the action might be. The ultimate goal is to help learners in establishing their own goals and critiquing their own performance(^{(470,84)})</td>
<td>Information [1,2,3,4]</td>
</tr>
<tr>
<td>&quot;[...] information describing students' or house officers' performance in a given activity that is intended to guide their future performance in that same or in a related activity. It is a key step in the acquisition of clinical skills&quot;(^{(777)})</td>
<td>Information [1,2]</td>
</tr>
<tr>
<td>&quot;[...] an informed, non-evaluative, and objective appraisal of performance that is aimed at improving clinical skills rather than estimating the student's personal worth&quot;(^{(1,57)}) (p 1)(^{(57)})</td>
<td>Reaction [1,4]</td>
</tr>
<tr>
<td>&quot;Giving trainees feedback means letting them know, in a timely and ongoing way, how they are performing&quot;(^{(267)})</td>
<td>Reaction [1,3,8]</td>
</tr>
<tr>
<td>&quot;Audit and feedback involves collecting information on performance measures for individual physicians and then providing this information to the physicians with comparisons with colleagues or other standards&quot;(^{(738)})</td>
<td>Reaction [1,5,6,9]</td>
</tr>
</tbody>
</table>

Characteristics: 1 = content; 2 = aim; 3 = recipient; 4 = form; 5 = preparation; 6 = source; 7 = provider; 8 = communication conditions; 9 = contextual factors
Feedback in clinical education

The aim of the feedback is motivational, for improvement, or to promote reflection. Feedback recipient is the person to whom the information is sent. Form of the information to be communicated is oral, written, specific, non-evaluative. Preparation before the information is conveyed includes collecting results or observing the subject. Source of the information can be from the person himself/herself (internal feedback), task results, or another source (external feedback). Feedback provider is the person who gives the information. Communication conditions include: timeliness, directness, and context. Feedback is given in each of these conditions.

Definition of feedback in clinical education

Based on the review above, we propose to define feedback in clinical education as: ‘Specific information about the comparison between a trainee’s observed performance and a standard, given with the intent to improve the trainee’s performance.’

How is this definition of feedback novel compared with earlier statements? Feedback in clinical education is seen as a form of communication. Dissection of the definition into 10 key elements provides clarity. The elements are: clinical education; performance and task; trainee; feedback provider; comparison between observed performance and a standard; observation; standard; specific information; intention, and improvement.

Clinical education

This refers to the ‘on-the-job’ context in general at a hospital or clinic, such as on the ward, in an outpatient clinic, operating room, general practice consultation room, or any other place where the trainee is involved in patient care.

Performance and task

In the clinical setting, many tasks are suitable for providing feedback, including history-taking, clinical examinations, reporting during patient handover, and working with colleagues on a task. The task must be observable. Even clinical reasoning, performed aloud, is subject to feedback.

Trainee

In clinical education the feedback recipient is the trainee. The trainee can be anyone in a clinical learning situation, be he or she a student, clerk, resident or other health care trainee. The trainee receives feedback to acquire the knowledge, skills and attitudes necessary to become a superb practitioner.

Feedback provider

The feedback provider is a clinical teacher conceived broadly. This may be a clinical staff member who is formally responsible for clinical teaching. The feedback provider may also be a resident acting as a clinical teacher for students, or an attending doctor for residents. Essentially, a feedback provider is someone who can envision a standard against which to compare the trainee’s performance. Key to this is the expertise of the feedback provider. This broad concept of ‘clinical teacher’ may therefore extend to anyone in this position.

Comparison between performance and a standard

The difference between performance and a standard determines the content of the feedback. This gap may be large or small, and positive or negative. By contrast with the cybernetic feedback definition of a negative feedback loop, feedback in clinical education for trainees who outperform a standard or expected level does not aim at decreasing the difference but may stimulate further development.

Observation

We cannot address feedback in clinical education when the trainee’s performance has not been observed. The way in which the feedback provider observes depends on the nature of the task. Direct observation occurs when the observer and the feedback provider are the same person. Observation can involve the watching of skill performance and the reading of written products. In both situations the feedback provider receives first-hand information about a task. Indirect observation occurs when the observer and feedback provider are different. An example is when a supervisor bases feedback on comments from other observers in a multi-source situation.
Standards of comparison

The feedback provider needs to know the standard of comparison to describe the difference between a performance and its outcome. Examples of standards include a protocol where a performance is described, the performance of colleagues, a trainee's previous performance, and clinical teachers' opinions about the performance standard. Standards vary from objective to subjective and from absolute to relative.

Specific information

Feedback must contain a minimum amount of specification to serve its purpose. Utterances that cannot be understood by the feedback recipient in behavioural terms (i.e. in terms of what has been done well or what could be improved) should not be called feedback.

Intention

An intention to give feedback for trainee performance improvement characterises the learning situation. This might be seen in the amount of time taken, the tone and accuracy in which the information is conveyed, or readiness to observe the learner again.

Improvement

The aim of feedback is trainee performance improvement. As explained earlier, improvement is not limited to a fixed endpoint. Continuous development of expertise makes feedback valuable in nearly all situations.

Discussion

An operational definition should increase conceptual understanding. An operational definition provides insight into a concept's characteristics and explains concept specificity, precision and generalisability. It reveals tacit assumptions or presumptions; discloses premises; and makes concept features plain. An operational definition also specifies procedures to identify or to produce the defined concept reliably. Does our definition meet these criteria?

Operational definition

Four procedures to produce or identify feedback are described in the definition. The procedures are:

1. Information gathering: the definition states that a trainee's performance should be observed;
2. Content: the content of the information is about the comparison between the trainee's observed performance and a standard;
3. Direction of the provided information: the clinical teacher provides information for the trainee, and the clinical teacher's intention is to improve trainee performance. This is not always directly observable, but can be discerned by asking about the feedback provider's motives when feedback is given or from indirect observation.

An operational definition should be reliable. It should be clear, measurable, and reproducible. Feedback data are collected by observation, the content of feedback is about a gap between trainee performance and a standard, and the direction of the feedback is from a clinical teacher toward a trainee. This is measured by asking participants or observing the feedback process. However, an intention is not directly observable. This must be probed or observed indirectly.

Conceptual representation

A conceptual definition refers to a general idea behind a definition. Feedback in medical education refers chiefly to information. Defining feedback as a cycle also has advantages. It is a rich definition because it includes information and reaction. The cycle analogy gives emphasis to outcomes compared with feedback as information or reaction. From a linguistic perspective, it better represents the meaning of the word 'feedback'. The word 'feedback' does itself suggest movement (process of feeding) and cycle ('back' refers to a return). So from this point of view, feedback as a cycle is most suitable. Finally, it is the original definition. Why do we not consistently use the original definition and define feedback as a cycle? Defined as a cycle, feedback includes the trainee's behaviour adjusted after observation and the exchange of information by the feedback provider.

Historically, the exact meaning of feedback in social science has evolved and expanded in scope over the past 30 years. Methodologically, a clear operational definition improves scholarly understanding and exchange. Table 2 reminds us that a concept may have several operational definitions.

Weak versus strong feedback

Our definition is meant to improve communication about the feedback concept and to serve research
purposes. Some of the procedures to produce or identify feedback and the 10 elements of our operational definition can be seen as variables that vary from weak to strong. Listing these elements allows us to distinguish ‘weaker’ and ‘stronger’ types of feedback. In Table 3 we show examples of these extremes.

Specifying the definition along a weak–strong dimension signifies a linguistic variability of the concept. We do not intend to equalise this with ‘worse’ or ‘better’ feedback. ‘Weak’ and ‘strong’ are only related to our definition.

Another question is: Which feedback is effective and which is not? This actually is a research question. Many variables have been mentioned in the literature as possibly influencing the effectiveness of feedback. To describe and validate these variables is a task for future research.

We believe that our definition of feedback in clinical education provides a clear point of departure for teacher training and research on the effectiveness of variables in feedback processes. The definition discriminates authentic feedback statements from those that do not qualify and contrasts weak and strong feedback.

### Table 3: Weak versus strong modalities of feedback, based on its definition

<table>
<thead>
<tr>
<th>Weak feedback</th>
<th>Strong feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competencies that are not observable</td>
<td>Well-observable tasks and competencies</td>
</tr>
<tr>
<td>Uninformed or non-expert observer</td>
<td>Expert observer and feedback provider</td>
</tr>
<tr>
<td>Global information</td>
<td>Highly specific information</td>
</tr>
<tr>
<td>Implicit standard information</td>
<td>Explicit standard</td>
</tr>
<tr>
<td>Second hand information</td>
<td>Personal observation</td>
</tr>
<tr>
<td>No aim of performance improvement</td>
<td>Explicit aim of performance improvement</td>
</tr>
<tr>
<td>No intention to re-observe</td>
<td>Plan to re-observe</td>
</tr>
</tbody>
</table>

Contributors: JMMvdR wrote the paper. WCM and OJG contributed major revisions and reviewed all versions. KMS commented on all major versions of the paper.

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Conflicts of interest: none.

Ethical approval: not applicable.

### REFERENCES

17. Frandsen KD, Mills MA. On conceptual, theoretical and empirical treatments of feedback in human
WFC/ACC/CCIAP EDUCATION CONFERENCE: TRANSLATING EVIDENCE INTO PRACTICE

Feedback in clinical education


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The following supplementary material is available from the authors: (1) a full description of the search strategies for identifying information about feedback in clinical education in the literature of social science, and medical education; (2) a table with 16 definitions of feedback in social sciences literature; (3) the references of general literature (n = 56) and reviews and meta-analyses in social science literature (n = 133).
Optimal Characteristics of Supervising Clinicians

Background Paper (2)
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Canadian Memorial Chiropractic College, Canada
Henrik Lauridsen DC
University of Southern Denmark, Denmark

AMEE Guide No. 27: Effective educational and clinical supervision

SUE KILMINSTER, DAVID COTTRELL, JANET GRANT & BRIAN JOLLY
University of Leeds, UK; Open University Centre for Education in Medicine, UK; University of Muenster, Australia

Abstract

Background: This guide reviews what is known about educational and clinical supervision practice through a literature review and a questionnaire survey. It identifies the need for a definition and for explicit guidance on supervision. There is strong evidence that, whilst supervision is considered to be both important and effective, practice is highly variable. In some cases, there is inadequate coverage and frequency of supervision activities. There is particular concern about lack of supervision for emergency and out-of-hours work, failure to formally address under-performance, lack of commitment to supervision and finding sufficient time for supervision. There is a need for an effective system to address both poor performance and inadequate supervision.

Supervision is defined, in this guide, as: "The provision of guidance and feedback on matters of personal, professional, educational development in the context of a trainee's experience of providing safe and appropriate patient care. A framework for effective supervision is provided:"

1. Effective supervision should be offered in context; supervisors must be aware of local postgraduate training bodies' and institutions' requirements. (2) Direct supervision with trainee and supervisor working together and observing each other positively affects patient outcome, improves resident development. (3) Constructive feedback is essential and should be frequent. (4) Supervision should be structured and there should be regular timetabled meetings. The content of supervision meetings should be agreed and learning objectives determined at the beginning of the supervisory relationship. Supervision contracts can be useful tools and should include detail regarding frequency, duration and content of supervision, appraisal and assessment learning objectives and any specific requirements. (5) Supervision should include clinical management teaching and research management and administration, pastoral care, interpersonal skills, personal development, feedback; (6) The quality of the supervisory relationship strongly affects the effectiveness of supervision. Specific aspects include continuity over time in the supervisory relationship. That the supervisors and their patients (there is some suggestion that supervision is only effective when this is the case) and that there is some reflection by both participants. The relationship is partly influenced by the supervisor's commitment to teaching as well as both the attitudes and comportment of supervisors and trainees. (7) Training for supervisors needs to include some of the following: understanding teaching; assessment, counseling skills, appraisal, feedback, careers advice, interpersonal skills. Supervisors (and trainees) need to understand that: (1) "helpful superordinate behavior" includes giving direct guidance on clinical work, linking theory and practice, engaging in joint problem-solving and observing feedback, reassurance and providing role models. (2) "helpful superordinate behavior" includes giving direct guidance on clinical work, linking theory and practice, engaging in joint problem-solving and observing feedback, reassurance and providing role models. (3) "helpful superordinate behavior" includes giving direct guidance on clinical work, linking theory and practice, engaging in joint problem-solving and observing feedback, reassurance and providing role models. (4) "helpful superordinate behavior" includes giving direct guidance on clinical work, linking theory and practice, engaging in joint problem-solving and observing feedback, reassurance and providing role models. 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Introduction

Why the Guide?

What is good educational supervision and who are the good supervisors? Documentation from the UK Department of Health (DH) 1995 and General Medical Council (GMC) 2005 (New Doctor, 2005; Good Medical Practice, 1999) has highlighted the need for good educational supervision, approval and assessment in postgraduate education. However, it is not always clear what supervision entails, who should or could supervise, what its effects are and moreover, what its benefits to patients and the service in general are. It is clear that some doctors receive excellent supervision. It is also clear that others receive inadequate supervision (Gent et al, 2005).

Effective supervision of trainees involves skills that are different from other more general competencies expected of a teacher or trainer (Hardin & Grosh, 2000; Heisketh et al, 2001). Supervision includes ensuring the safety of the trainee and patient in the course of clinical care; giving feedback on performance; both formally and through appraisal, initial training and continuing education planning; monitoring progress; ensuring provision of careers advice; ensuring an
The Roles of Graduate Education Programs and the Habit of Life-Long Learning in Reinforcing Evidence-Based Practice

Background Paper (1)
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Durban University of Technology, South Africa
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Does Continuing Education Improve Physical Therapists’ Effectiveness in Treating Neck Pain? A Randomized Clinical Trial
Joshua A Cleland, Julie M Fritz, Gerard P Brennan, Jake Magel

Background and Purpose. Physical therapists often attend continuing education (CE) courses to improve their overall clinical performance and patient outcomes. However, evidence suggests that CE courses may not improve the outcomes for patients receiving physical therapy for the management of neck pain. The purpose of this study was to investigate the effectiveness of an ongoing educational intervention for improving the outcomes for patients with neck pain.

Participants. The study participants were 19 physical therapists who attended a 2-day CE course focusing on the management of neck pain. All patients treated by the therapists in this study completed the Neck Disability Index (NDI) and a pain rating scale at the initial examination and at their final visit.

Methods. Therapists from 11 clinics were invited to attend a 2-day CE course on the management of neck pain. After the CE course, the therapists were randomly assigned to receive either ongoing education consisting of small group sessions and an educational outreach session or no further education. Clinical outcomes achieved by therapists who received ongoing education and therapists who did not were compared for both pre- and posttreatment periods. The effects of receiving ongoing education were examined by use of linear mixed-model analyses with time period and group as fixed factors; improvements in disability and pain as dependent variables; and age, sex, and the patient’s initial NDI and pain rating scores as covariates.

Results. Patients treated by therapists who received ongoing education experienced significantly greater reductions in disability during the study period (pretraining to posttraining) than those treated by therapists who did not receive ongoing training (mean difference = 4.2 points, 95% confidence interval [CI] = 0.60, 7.7). Changes in pain did not differ for patients treated by the 2 groups of therapists during the study period (mean difference = 0.47 point, 95% CI = -0.11, 1.0). Therapists in the ongoing education group also used fewer visits during the posttraining period (mean difference = 1.5 visits, 95% CI = 0.81, 2.3).

Discussion and Conclusion. The results of this study demonstrated that ongoing education for the management of neck pain was beneficial in reducing disability for patients with neck pain while reducing the number of physical therapy visits. However, changes in pain did not differ for patients treated by the 2 groups of therapists. Although it appears that a typical CE course does not improve the overall outcomes for patients treated by therapists attending that course, more research is needed to evaluate other educational strategies to determine the most clinically effective and cost-effective interventions.
The Roles of Graduate Education Programs and the Habit of Life-Long Learning in Reinforcing Evidence-Based Practice

Background Paper (2)
Lise Lothe DC

Norwegian Chiropractic Association, Norway

The Clinician-Scientist: Research Skills as Part of Life-Long Learning for Chiropractors

Background
Evidence-based practice enables chiropractors to provide what is scientifically proven to be the best patient-centered care whilst maintaining the autonomy as an expert. If chiropractors provide scientifically proven care there is less justification for external practice constraints. This defensive strategy depends on accepting mechanisms of external decision support such as peer-reviewed research literature and clinical guidelines, and at the same time acknowledging that intuition, habitual practice, unsystematic clinical experience and pathophysiologic rationale are inappropriate means for making effective clinical decisions.

To fully appreciate and implement evidence-based practice, practitioners must understand different forms of clinical research design, and the appropriate research designs to answer particular types of clinical questions[1]. Searching the literature for clinical answers reveals an unmet need for clinical research in the chiropractic profession. It is essential to inspire chiropractors to perform more research and for clinicians to keep updated on how to use the research informed knowledge base throughout professional life.

Implementation strategies for translating research into practice remain difficult[2] and provide both a challenge and an opportunity for all programs that aim at delivering evidence-based postgraduate training. In spite of its emphasis in undergraduate chiropractic education, the subject of research methods is not commonly covered in continuing professional development (CPD) courses. Here is presented a pilot program that incorporates CPD in research methods for chiropractors with the possibility of obtaining academic research qualifications.

Method
With support from the European Chiropractors’ Union and the Norwegian Chiropractors’ Association, a Research Workshop for clinicians was offered at the University of Stavanger aiming to develop postgraduate research competency amongst clinicians and to recruit chiropractors to research. This course set out not only to develop skills in clinical research design, data collection and data analysis, but also to prepare the chiropractor to identify potential areas for research inquiry and to
systematically plan research investigation relevant to an area of chiropractic practice. Furthermore, the course was intended to give the participant the foundation for developing the necessary skills for planning a PhD research project alone or as part of a research group.

The program was delivered as a university based 20 European Credit Transfer and Accumulation System (ECTS) credit course over seven contact weekends covering topics of evidence based practice, research methods, statistics, ethics, research resources and funding. Students were assessed through assignments showing competency in critical literature review, case report writing, podium presentation of the proposal at a mini-symposium and the production of a research protocol as the final assessment. Non-student participation attaining only CPD points was also possible. A student evaluation survey was completed after the end of the academic year.

Results
28 chiropractors attended, 16 as students handing in assignments, 12 as non-student participants gaining CPD points. Three submitted a final protocol and two registered for a PhD program at a university after completion of the program. A network of research clinics was established for data collection in future multicenter studies and the participants developed a demographic survey of chiropractors in Norway as an extracurricular activity.

Discussion
The program was well received by the participants and gave them the tools and resources to perform research and to use research in clinical practice. The university link allowed for awarding of ECTS points and valuable access to teaching staff and resources. The two-level attendance system afforded an opportunity for establishing a network of research clinics providing the clinicians with a fundamental understanding of the research process and the importance of optimal data collection. The attendance system stimulated five of the non-students to submit student assignment and receive ECTS points for their attendance.

As with all health care education the emphasis is for the student chiropractor to learn clinical skills and to have an understanding of research in order to use the available evidence to answer clinical questions, not necessarily to perform research in clinical practice. When in practice, clinicians read the literature and undertake continuing professional development (CPD) courses to keep their knowledge up to date. CPD programs rarely offer research-competency enhancement beyond MSc level and research skills are not perceived by the chiropractor as a required CPD activity. Only a few programs provide continuing education courses for clinicians that maintain research skills from undergraduate education, let alone enhancing research qualification by providing research methods as part of continuing education programs.

Other musculoskeletal health care professions also face challenges in recruiting clinicians to research. Primary obstacles are lack of appropriate mentorship to cultivate interest in research and a financial disincentive to become a clinician-scientist. The use
of “seed” money to produce funding applications, protected time to research and mandatory research rotation during residency or graduate education programs (GEP) have been suggested as potential models for attracting more clinicians to research.\textsuperscript{[5, 6]} There is evidence that research experience during residency and primary authorship of manuscripts is associated with higher interest in research and in embarking on a scientific career.\textsuperscript{[4, 7]} Assisting new chiropractors in getting their undergraduate research projects of sufficient quality published should be prioritized in GEP programs.

**Conclusion**

Availability of a leading-edge research infrastructure is critically important for providing a supportive and nurturing environment for research. Making strong formal connections to universities and research institutes and providing assistance for potential researchers to realize their projects is a responsibility of the politicians in the profession. Evidence-based practice depends on practice-based evidence which can be facilitated by setting up an infrastructure of research clinics to collect data from clinical practice.

Research should be included as an integral part of GEP programs and be revisited through CPD events contributing to evidence-based life-long learning. The profession cannot rely on private CPD providers to ensure the maintenance of research skills for chiropractors. National associations should be mindful of the favourable influence supporting GEP programs that stimulate to a research career for young clinicians will have on the profession. CPD in research methods should be delivered through chiropractic institutions and universities in collaboration with the chiropractic associations who has the political will to support the evidence-based development of chiropractic health services.

**References**

Teaching Manual Techniques and Therapies: How to Educate Students about those with Limited Evidence

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Teaching manual techniques and therapies: How to educate students about those with limited evidence.

Introduction:
To teach manual techniques and therapies is difficult because there is very limited factual evidence in relation to indications, execution, mode of action, and effect and duration of effect.

Most chiropractic colleges have a sensible approach in relation to which techniques and therapies they teach. Yet chiropractors often opt for “weird” techniques. Within our profession we have learnt to live with, and even to accept as inevitable, unsubstantiated claims and ridiculous behavior. However, recently we learnt, what repercussions this can have on an entire profession. Therefore, and long overdue, we are now asking ourselves: What can be done to minimize such practice behaviour?

This presentation will suggest four main hurdles that could be removed in order to minimize the risk of confused and unsuitable clinical practice:

1) The clinical fallacy that the usefulness of tests and effect of treatment can be judged in everyday practice
2) The lack of realistic insight into prognosis with chiropractic treatment
3) The absence of a simple but stringent clinical reasoning pattern
4) The belief that it is not possible to be a successful clinician with a humble attitude to therapeutic possibilities.

It will be argued that we have to address these problems in our undergraduate programs and an example of innovative concepts that can be used to help in this process is provided for hurdle number 3, by explaining how a simple reasoning pattern can be used to determine whether tests or techniques are suitable for use or not.

Hurdle #1: The clinical fallacy that the usefulness of tests and effect of treatment can be judged in everyday practice

Students and staff must be thoroughly aware of the fact that a clinical diagnostic method is not valid and useful because it is claimed that “it works” and that it is not possible to determine if treatment “works” or not in ordinary clinical practice. For such
claims to be made, proper research designs have to be used, involving blinding of observers, control groups and suchlike, which are not available in every day practice.

**Hurdle # 2: The lack of realistic insight into prognosis with chiropractic treatment**

For some reason, chiropractors have very high expectations of their treatments. However, clinical trials show that, although there is an effect of our treatment, it is not markedly better than it is for other types of (lucid) therapeutic approaches. Further, back pain is not, as previously thought, a short-lived condition but in many people it is a lingering or returning condition. Chiropractors are convinced that their treatment shortens the span of this condition and some also believe that they can prevent it from returning (or perhaps even from appearing in the first place). However, it must be clearly explained and accepted that there are no studies that have shown these beliefs to be correct. This must be accepted, learned to live with and considered normal and not simply the effect of “bad” research.

When chiropractic students graduate with an expectation of being able to cure most their patients, they risk becoming disappointed when their high expectations fail to become fulfilled. This disappointment is what feeds the technique peddlers and sellers of the weird and wonderful. If we could install a realistic sense in our students and allowed them to be realistic clinicians, would they not have a more fulfilling professional life?

**Hurdle # 3: The absence of stringent clinical reasoning**

In clinical practice, decisions have to be made every day and many times a day, also when the evidence is lacking. In relation to manual techniques and therapies we have very little evidence on the when, what, how, how often, why and why nots. Instead the choice of technique seems to be a question of the chiropractor’s body build and manual skills combined with the patient’s size, shape and sturdiness. The suitability of the manual methods seems to be less important and there is no guideline on how to deal with this part of the clinical encounter. In fact, our profession does not have a common understanding of how to relate to the manual aspect of our work.

If we could help the students and future chiropractors to apply some simple logical criteria to each new test, method and treatment system that they meet on their path, would they not become less confused? The main purpose of this presentation is to present such a simple method of approach; the Traffic Light System.

**Hurdle # 4: The belief that it is not possible to be a successful clinician with a humble attitude**

The final point I want to mention briefly, is that attitudes towards the clinical possibilities have to match real life. The exaggerated need for many chiropractors to appear enthusiastic and omnipotent may not be appreciated by our patients.
Satisfaction with services is a question of fulfillment of expectations not the selling of promises. Dissatisfaction arises when there is a gap between expectations and outcome. Would it not be a good idea to teach our students to become honest, reliable, and realistic, to make this gap as small as possible?

Conclusions:

The concepts of how best to teach manual techniques and therapies have to be revised. A realistic spirit and a more humble attitude should be considered as a means to lessen the gap between expectations and results. Further, the concept of evidence should be taught in such a way as to make clinicians able to think logically and stringently. One example of how to deal with the grey zone of techniques and therapies is presented, the Traffic Light System.
Teaching Manual Techniques and Therapies: How to Educate Students about those with Limited Evidence

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Chiropractic therapeutic technique systems are part of our professional heritage and deeply embedded in our culture (Cooperstein & Gleberzon, 2004). In developing this culture, the chiropractic profession has remained dedicated to the use of manual techniques and related therapies throughout its development over the past 100 years or more. This is evidenced by the plethora of distinct chiropractic technique systems currently in use today. Furthermore, it has been estimated there are somewhere in the region of 300 discrete chiropractic techniques practised by the profession worldwide which provides some sort of perspective on this issue (Cooperstein and Gleberzon, 2004). Regrettably, many of these ‘technique systems’ have never been subjected to rigorous scientific scrutiny or clinical trials. Despite all these techniques and clinical systems in use today, there are only a few published research studies comparing one manual technique system against another. Consequently, there is limited empirical evidence to substantiate their clinical use. Nonetheless, many of those who promote these named techniques continue to disregard basic science and a clinical evidence base and expound unreliable diagnostic methods, incorporate questionable use of X-ray imaging and the use of serial x-rays, make unsubstantiated clinical claims and employ manual procedures with rationale that contravene known biomechanical principles and ignores the characteristic properties of various biomaterials. The irony of this situation may simply be that most if not all manual techniques may cause the same neurobiomechanical effects at a clinical level with little difference in clinical effect as a consequence of varying applied forces which seem to be common to most technique systems. The mechanical, physiologic and neuromuscular effects have been studied and reported extensively in the literature and the chiropractic profession must integrate this knowledge into professional practice (Herzog, 2000). For example, Triano (2003) has stated that, regardless of the manual technique, there are only six ways of mechanically loading the spine (push pull, twist or traction), and its related tissues despite any biomechanical or clinical claims. These loads can be applied in a variety of manual and mechanically assisted methods common to chiropractic practice (Triano, 2003). Notwithstanding, it is time for the chiropractic profession to begin the overdue task of evaluating these technique systems in light of the known biomechanical and neuromuscular effects via rigorous research enquiry. Bearing this in mind and in order to raise its credibility, the chiropractic profession should embark on a research campaign to undertake a critical comparison of the efficacy of individual techniques or between specific techniques with respect to a single disease process and relate this to measurable clinical outcomes. In addition various ethical issues need to be considered including some of the legal implications that may be in place in some jurisdictions that govern the use of ionizing radiation.
Therefore, in order to educate students about manual techniques and other therapies with limited evidence, the undergraduate curriculum must concentrate on developing tools to critically appraise and analyze various techniques systems and the variety of manual therapies at their disposal (Humphreys, 2012). Legal and ethical implications must be presented in parallel in order to protect patients and ensure professional integrity is maintained (Kinsinger, 2012). At the WIQC we incorporate a diversified approach to manual skills training, not as a specific named technique but as an intellectual approach or “model” to bring together the collective evidence and basic sciences related to manipulative sciences (Ross and Kondracki, 2012). Undergraduate chiropractic educational level curricula must include an integrated evidence-based approach to teaching manual techniques and other therapies so that the learning process is underpinned by core functional and biomechanical knowledge which includes basic science, diagnostic, therapeutic and clinical knowledge to prepare the student for manual skills learning (Haines et al., 2000; Humphreys, 2012). A keen understanding of these biomechanical principles provides a foundation for manual skills learning and enhances a critical understanding of their clinical utilization (Herzog, 2000; Humphreys, 2012; Ross & Kondracki, 2012). This intensive psychomotor development, which is strengthened by an in-depth functional and biomechanical approach to the neuromusculoskeletal system, is the hallmark of chiropractic manipulative sciences and forms the basis for an integrated clinical approach to patient care. The diversified approach attempts to apply the most ideal technique within the context of the reality of the clinical picture’ and is based upon sound neurobiomechanical–orthopaedic principles (Gitelman and Fligg, 1992) and the foundation of the biomechanical model (Fligg, 1985). Diversified techniques provide immense clinical flexibility, adaptability and variety as each procedure can be employed as either a mobilization or an adjustment/manipulation depending upon the specific biomechanical indications. The ‘diversified’ approach to the manipulative sciences is regarded as the core of chiropractic (Cooperstein and Gleberzon, 2004). This versatility and inherent variability begins to prepare the student for the fundamental decision-making and problem-solving skills required for clinical practice and provides them with a methodology to critically evaluate and rationalize various technique systems.

Furthermore, the importance of enhancing critical thinking and problem solving at undergraduate level to develop confidence and establish sound clinical judgment is of utmost importance in a patient-centred model. (Eisenberg et al., 1998; Mootz et al., 2005; Murphy et al., 2008; Myers et al., 2008). Notwithstanding, chiropractic technique systems and skills should be taught with understanding and reasoning, not merely by aimless repetition and rote learning. Nonetheless, no one doubts that structured practice is the key ingredient toward the learning of complex motor skills, however this must be combined with the background science and clinical application (Triano, 2000). Furthermore, placing manipulative skills and procedures in their intended clinical perspective (clinical framworking) should also enhance the learning and performance of these skills (Humphreys, 2012).

In summary, the standard of chiropractic undergraduate education has significantly improved over recent years as a direct result of affiliation with institutions of higher learning, development of professional chiropractic educators, agreed accreditation
programme outcomes and the knowledge base as provided by both basic science and clinical research. As a result graduates have a much better understanding of the mechanical, physiologic and neuromuscular effects of manual techniques and therapies and they possess the tools to discriminate between those techniques that are evidence based and supported by science and those that are ethically unsound. This will move the profession forward.

References


Teaching Manual Techniques and Therapies: How to Educate Students about those with Limited Evidence

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There is certainly a tight rope to walk when discussing technique, clinical practice and scientific evidence. The proscriptive protocols of technique systems often have little room for challenge and innovation, although they may hold much wisdom and experience. Clinical practice inherently leads us down a biased path of our own uncontrolled experiments, yet still requires some intuition and creativity since it is rare that patients present with classic cases. Scientists must struggle with the balance of rigor and relevance. The most highly regarded study, the randomized controlled trial, is all too often inapplicable to individual patient care. Systematic reviews tend to eschew lower quality studies that might lend them more relevance in favor of eliminating bias. In all of these circles there is a balance to maintain and luckily they overlap and support one another in aggregate.

We must try to reconcile these competing interests to devise a unified approach to our thinking. I practice in a busy corporate multidisciplinary health center; I teach evidence based practice at a chiropractic college, as well as differential diagnosis, orthopedics and a motion palpation club. Trying not to contradict myself and maintain a unified viewpoint in each of those settings is at times, a delicate balance. Teaching manual therapies and techniques in the face of limited evidence may seem like a challenge at first glance, but truthfully teaching without evidence is precisely what every profession has been doing since inception. That is, if we consider only scientific evidence. Previously, there was no scientific evidence whatsoever to support many of these therapies. That did not deter our forefathers in the least from teaching, for they had all the evidence they needed, clinical experience. Unfortunately, clinical experience is very susceptible to bias and sometimes they were wrong.

It is in fact only recently that we have begun to deal with this juxtaposition of clinical experience and scientific evidence. One's experience in practice is now held up against the scientific literature and the latter often has lackluster results compared to the former. Both scientific evidence and clinical experience have their strengths and weaknesses and it is important to present to students what those are. By understanding the limitations of different types of articles, evidence and ways of knowing information, we can arm them to weigh and apportion knowledge appropriately. The limited findings and paucity of literature on particular topics must not deter us from continuing to teach and improve patient care. Areas where we do have knowledge are generally relevant where we have far less. Is there much difference between a well studied lumbar adjustment and a poorly studied thoracic one? Is myofascial pain or muscle spasm inherently different in an adult as it would be in a child? If we were to only teach or
practice what was supported by high quality, methodologically sound RCTs we wouldn't need very many technique classes and patient care would certainly suffer.

The notion of patient-centered care means we do everything we can to help the patient's problem. When a patient presents with mechanical thoracic pain do we say: "Sorry, we don't have as many high-quality studies for thoracic pain like we do with the neck and low back, can you come back with a headache or low-back pain?" Instead, as a clinician you must treat based on your experience and whatever scientific evidence there may. I would suggest that being an educator is no different, we teach to our experience and what evidence is available. Doctor is Latin for teacher, after all.

Many topics are well documented so far, but few of the specific therapies, techniques and maneuvers have been studied to any great degree. Even when they are studied, many diagnostic procedures and orthopedic tests are performed differently across multiple papers. The challenge is not how to teach in the face of limited evidence, but how to incorporate what evidence does arise into our techniques and curriculum. This is the same challenge that practitioners face after leaving the safety of our institutions. Standards of care change over time and students require the tools to make those changes and keep up with the literature. As teachers, part of our responsibility is to teach them what we know, but also to teach them how to learn more. Our successful modeling of integrating scientific evidence into our technique curriculum should inculcate them to use a similar approach. We should view evidence as a guide for growth and improvement of our practices, not as a limitation of our ability. Evidence-based practice incorporates the best scientific literature with good clinical judgment and empathy for patient values.
Proprietary Technique Systems and their Influence on Chiropractic Education Today: What are the influences, and How Do We Best Respond?

Background Paper (1)
Rick Ames DC
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Inclusion of psychomotor and clinical based skills within a chiropractic educational program should be supported by effective learning and teaching. It is my opinion that we are able to easily incorporate proprietary techniques within the program as long as we:

- identify both the skill set within the technique and where this fits within the program
- create a culture within the program of critical thinking so that students are able to appraise the technique and the theories behind its development and mitigate the entrepreneurial aspects that lead to external teaching of these techniques
- identify motivations of the students individually and as a group and whether the technique is suitable for undergraduate and post-graduate practice
- identify whether the technique is part of a life-long learning strategy we wish our students to achieve post-graduation
- identify whether the technique is integral to a multi-modal, broad scope approach to chiropractic practice we wish to instil in our undergraduate and post-graduate students (1,2)

In order to identify the above we must use a set of learning and teaching principles that underpin our programs. After reviewing the literature in regards to principles of learning and teaching I have decided to base this commentary on the 7 learning principles espoused through the Eberly Centre for Teaching Excellence from Carnegie Mellon University (3).

The 7 principles are:

1. Students’ prior knowledge can help or hinder learning.
2. How students organize knowledge influences how they learn and apply what they know.
3. Students’ motivation determines, directs, and sustains what they do to learn.
4. To develop mastery, students must acquire component skills, practice integrating them, and know when to apply what they have learned.
5. Goal-directed practice coupled with targeted feedback enhances the quality of students’ learning.
6. Students’ current level of development interacts with the social, emotional, and intellectual climate of the course to impact learning.
7. To become self-directed learners, students must learn to monitor and adjust their approaches to learning.

For this commentary, principles 1, 3, 4, 6 and 7 apply the most directly.

1. **Students’ prior knowledge can help or hinder learning.**

   It has been shown that “Previous help from chiropractic and a desire to pass on this help were common motivations for studying chiropractic.” (4). Job analysis surveys show that chiropractors practice a range of techniques in their post-graduate practices. Whilst “diversified” technique is by far the most common, proprietary techniques are utilized (1,2,5). It would be safe to conclude that students had not just been helped by chiropractors using “diversified” technique only.

   In line with this principle, having been “helped” by treatment of a proprietary technique can be a positive influence and motivator through the experiential knowledge gained. Conversely the experiential knowledge can be a hindrance depending on how that proprietary technique is approached by the academic staff and whether that technique will be available for the student within the program.

3. **Students’ motivation determines, directs, and sustains what they do to learn.**

   As per “#1” above, student motivation for entering the chiropractic program will depend on the availability to study principles and skill sets that they believe will replicate what they believe is the basis of the proprietary technique and the profession.

   An observation I have made in the course of teaching is that many students transcend their original motivation once they encounter the broad scope of chiropractic practice. Will the student have the ability to transcend their original motivation if only a narrow scope is taught?

4. **To develop mastery, students must acquire component skills, practice integrating them, and know when to apply what they have learned.**

   This is the basis for all our teaching of psychomotor skills (6).

   Do proprietary techniques enhance the ability for the student to acquire component skills? I believe that they do. However the skill sets within the proprietary technique must be identified, especially differentiating assessment skills and treatment skills.
It is my assertion that proprietary techniques are best introduced near the end of a program when several things have occurred:

- the student has had a chance to learn a base line set of skills in both assessment and treatment
- the student has had a chance to utilise, in a clinical setting, the base line set of skills in both assessment and treatment

If we look at the development of proprietary techniques, they were developed and mostly taught in a post-graduate setting as need was established for patient populations that were beyond a narrow or uni-modal scope of practice (7).

6. Students’ current level of development interacts with the social, emotional, and intellectual climate of the course to impact learning.

In line with this principle a chiropractic program needs to be populated by students with a diverse background of technique knowledge, needs to have a broad-based and multi-modal approach to technique and must use evidence-informed practices of learning and teaching. This will, in my opinion, provide a substrate for development of a student with assessment and treatment integration abilities in both under-graduate and post-graduate practice, especially in the areas of case mix, gender and age groups and co-morbidities (1,2).

7. To become self-directed learners, students must learn to monitor and adjust their approaches to learning.

It is my opinion that the inclusion of proprietary techniques within a chiropractic program challenges the student (and faculty) to think beyond a uni-modal approach to technique. It enhances their ability to continue as a self-directed, life-long learner in the quest for evidence-informed knowledge of assessment, treatment and patient management (8).

However the need for critical thinking skills within the curriculum is important to allow students to evaluate many of the non evidence-based theories that tend to accompany these techniques (8,9,10).

In my opinion we should never “throw the baby out with the bathwater”, instead we should embrace our heritage, evaluate those proprietary technique commonly used in chiropractic practice and attempt to incorporate them in an evidence-based manner into our chiropractic programs. (1,11)
References


2. Hoskins W, Pollard H, Garbutt P. How to select a chiropractor for the management of athletic conditions. Chiropractic & Osteopathy 2009, 17:3


Proprietary Technique Systems and their Influence on Chiropractic Education Today: What are the influences, and How Do We Best Respond?

Background Paper (2)
Rick Ames DC
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Daryl Ridgway DC
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Can chiropractic survive its chimerical nature?

"The only way to avoid the slippery slope is to stay off the slope".

George F. Will
Columnist and Journalist

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Associate Professor,
Canadian Memorial Chiropractic College

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If we were to compare the profession of chiropractic to creatures of legend, in its early days chiropractic was like a hydra, whose practitioners possessed a 'body' of core beliefs and practice patterns but a rather contentious leadership, one with many 'heads'. Although there were different personalities vying for control and influence (the Palmers, Carver, Howard and many others), the practice of chiropractic then was probably not as variable as it is today.

Later on, chiropractic evolved into something more like a chimera, a mythical creature with the head of a lion, the body of a goat and the tail of a serpent - diversity at its most extreme. By necessity, amidst its war with organized medicine, it had become one profession, but protracted technique civil wars had divided the body chiropractic into a slapped together beast, although there are some indicators that chiropractors do share some similar beliefs and practice activities. That said, we (and
The origin of the species
Darwin's seminal work on the process of speciation hypothesized that divergent types of the same creature stem from a common ancestor but developed in response to different environmental stresses. This model can be applied to the chiropractic field as well. In the beginning, there was only one approach to chiropractic. Diagnostically, by palpation, DD Palmer discovered spinal joints that were, by his account, 'racked out of place' and thus needed to be 'racked into place' as a means of cure. The first case was Harvey Lillard, a deaf junior. DD's intent was to restore his hearing, not necessarily to address the custodian's thoracic spine subluxations. And it came to pass that Harvey's hearing was restored. There is evidence to suggest DD was very secretive of his discovery and, were it not for a near fatal accident, DD might have only taught 'chiropractics' to a select few hand-picked students. In the early days of chiropractic, chiropractors did it DD's way.

After a decade had gone by, and BJ Palmer had assumed the mantle of power from his father, the teaching of chiropractic began to change. As his hegemony in the Fountainhead (c. 1910) became more secure, BJ developed different methods of chiropractic, eschewing many of his father's core beliefs and methods of cure. BJ Palmer introduced, indeed practically legislated, a number of philosophical and clinical innovations be used for optimum patient care (see Table 1). His extreme advocacy of thermography in the mid-1920s and of upper cervical care in the early 1930s further exacerbated the profession's discord. Many of these innovations were controversial and engendered opposing viewpoints, prompting many of BJ's contemporaries to leave the profession.

Table 1
Changes to the Fountainhead initiated by BJ Palmer (c. 1910)\textsuperscript{7,8}

<table>
<thead>
<tr>
<th>Menic system of diagnosis</th>
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<tr>
<td>The concept of 'major' and 'minor' subluxations</td>
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<tr>
<td>Restriction of adjusting to five of six of the 'main' vertebrae per visit</td>
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<td>The recoil method of adjusting</td>
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<td>Limitation of adjusting the vertebral column alone</td>
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<tr>
<td>Condemnation of 'mixing'</td>
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<tr>
<td>Advocacy of 'straight chiropractic'</td>
</tr>
<tr>
<td>The belief that virtually all disease is due to vertebral subluxations</td>
</tr>
<tr>
<td>Use of X-ray for diagnostic purposes</td>
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</tbody>
</table>

Fountainhead and ultimately establish their own colleges [DD among them\textsuperscript{11}] and develop proto-techniques that would eventually evolve into the more recognizable systems we see today.\textsuperscript{11} Strife in the House of Palmer thus set up the stage for many other divisions that ensued, along fault lines that intersected each other in a wildly complicated pattern: straight versus mixers, mechanistic and reflex practitioners, and segmental and structural approaches.\textsuperscript{13} Just to name a few.

Chiropractic speciation today
Chiropractic speciation shows no sign of abating at this time. Moreover, unlike Darwin's origin of species, where fitter organisms replace those less adapted to the changing environment, new techniques stand alongside, rather than replace, the already impressive array of clinical options available to the field practitioner. Nature, 'red in tooth and claw', shows no compassion when an organism is out-competed for limited environmental resources. By comparison, state or provincial licensing boards and chiropractic colleges, handicapped by having limited information on which technique is safest and effective, have proven most reluctant to adopt regulations that would cast any technique to the chiropractic scrap-heap. If in Nature the fittest survive when the environment changes, in chiropractic the fittest techniques are those most capable of creating environments in which they can
Table 2a
Benefits of retaining different chiropractic technique systems

- Allows for systematic method of patient examination and treatment
- Variety of diagnostic and therapeutic options when faced with clinical diversity
- Tailor treatment to patient preferences and disabilities
- Option to use alternate therapy in event of doctor injury or disability

Table 2b
Detriments to retaining different chiropractic technique systems

- Confusion among the public, third party payers and other stakeholders of what constitutes ‘chiropractic’
- Propagate pseudo-science
- Make outlandish claims
- Prey upon naive chiropractic students
- Exploit the field doctor’s perpetual need to increase their practice volume, basing these actions independent of established clinical superiority

The contemporary chiropractic environment

The current chimerical nature of the chiropractic profession does not come without challenges. Third party payers, for example, may be at a loss to know which, if any, treatments to pay for—especially when many techniques claim to be more efficacious than others and some claim not to address clinical symptoms at all (often a requirement for reimbursement). Government regulators are often unsure who to listen to with respect to representation from the profession, what with both ‘Broad-scope’ and ‘subluxation-based’ technique representatives both clamoring for public attention.

Although chiropractors have the privilege of being permitted to self-regulate, regulatory bodies are charged with what at times seem to be mutually exclusive tasks. On one hand, it is their responsibility to protect the public and to ensure that all chiropractors meet minimal clinical competencies and act in a reasonable fashion. On the other hand, regulatory bodies (at least those in Canada) are there for the membership as well, to oppose any attempt by governments or other health care professionals to arbitrarily stifle clinical freedom or reduce chiropractic’s market share. Regulators cannot act in such a Draconian manner that they are perceived to be tyrannical or as the lackeys of government officials or, worse still, medical puppets. Nor can they allow themselves to be seen by government overseers as being unable or unwilling to control fringe practices either. But where does clinical adventurism and experimentation cross the line to abject quackery? At what point does clinical practice become patient experimentation that requires research protocols and protections? In the event that proper safeguards are not developed, the profession potentially leaves itself vulnerable to several negative repercussions (see below).

And then there are the patients. Despite the dim view from third-party payers and some other stakeholders, patients often prefer clinical diversity, as they are accustomed to receiving in other health care fields, such as psychiatry and many other aspects of medicine. If one approach does not work for that patient, there is a plethora of others from which to choose.

The parsimonious and expansive views of chiropractic technique

What you might proclaim, only two views? Yes, we rejoins, with regards to this issue at least, we think the opinions of chiropractic organizations can be generally divided along two ideological lines. In the parsimonious view, the extreme diversity in the profession is seen as the single greatest barrier to the profession’s survival and acceptance by the outside health care community. The result, if not the intent, is to champion for the use of a relatively limited number of tools in a practitioner’s clinical armamentarium that have withstood the rigor of...
scientific scrutiny. It sees new technique systems as essentially avaricious, with ethical standards that are a downwardly moving target, whose sole purpose is to separate a patient’s money from their wallets. Indeed, some advocates of new technologies unabashedly promote their product less as a useful clinical tool but more as a better means to generate income, even in a managed care environment. In the parsimonious view, the ever-expanding universe of technique systems in chiropractic is a slippery slope best avoided by staying off the slope.

In the expansive view, technique developers, having codified a group of clinical observations into a standardized approach to patient care, and often having brought forth a purported seminal discovery or innovation in patient care, are seen as the driving force for improvements in chiropractic care. In this view, technique developers are more central than chiropractic colleges in fostering progress and they are seen to be more likely to conduct truly useful research applicable for patient care.

The Nexus of diversity, knowledge and ethics

At the most recent ACC-RAC, FCLB and ACA House of Delegates conferences Perle specifically explored what he saw as financial pressure potentially surmounting whatever barriers some practitioners may erect for the protection of their own moral integrity. The need to respond to the demands of fiscal distress, he contends, can lead to the making of decisions that are only motivated by profit. However, the deliberate ignorance of the propriety of one’s own actions, or even a process of rationalization (“the insurance company is acting unreasonably with me so I will take advantage of them”) does not give a practitioner carte blanche to act in a manner they know is unethical (see also 15).

So perhaps herein lies the issue. In trying to decide whether the parsimonious or expansive view of chiropractic technique is more reasonable, our generalized limited (but growing) body of knowledge, as seen in all health care professions, is most inhibiting. While much is known about chiropractic efficacy and safety in general, little is known about the specifics of what technique works best for a particular condition. That said, this lack of knowledge cannot be used as an excuse for the suspension of proper and appropriate ethical conduct in private practice.

Although it has become something of a cliché that extreme technique diversity hurts the profession, a point we do not question, we think the point is overdone. What is probably more harmful to the profession, and please forgive us for being blunt about it, is deliberate fraud. Some of this takes the form of dubious machines, subluximeters and the like, and some show up in the form of outlandish billings and utilization rates. We have seen very different products and techniques, as different from one another as can be imagined, unite when it comes to nefarious patient management schemes.

As previously mentioned regulatory agencies have one preeminent objective: to assure the public safety by attempting to ensure that all licenses maintain a minimal level of competency. Minimal standards do not mean that all aspects of practice need be homogenous, only that a lower level of homogeneity must exist. The desire to achieve clinical excellence is motivated by one’s moral compass: it is an ethical decision. Thus, the ethically motivated desire to maintain clinical excellence in concert with the heterogeneity of judgment and taste will still produce diversity within the profession that can be good as long as judgment is not clouded by deliberate ignorance or rationalization.

If the profession as a whole does not vigorously meet this most basic of professional requirements—self-regulation—the consequences could be dire. Currently, chiropractors enjoy what could be classified as “Group A” status in health care; that is, they are able to use the designation of “doctor,” to diagnose a patient and to provide patient care directly without medical supervision, not unlike dentists, psychologists and nurse practitioners. However, if, as a profession, chiropractors do not limit their quinary nature, whereby some members engage in either unethical behavior or bizarre practice activities that are so extreme that they defy logic or explanation, then chiropractors could, perceptually if not legally, be demoted to a “Group B” status, lumped together with homeopaths, acupuncturists and massage therapists. The author from Ontario (Gleberman) may be more sensitive to these concerns having seen the triple-whammy of the unsuccessful affiliation process with York University, disappointing recommendations from the Lewis Inquest and the delisting of chiropractic services from the Ontario Health Insurance Plan. That said, the chiropractic profession, in Canada, in the United States and worldwide, must be alert to the possibility that continued un-
checked extremist chimerical behavior poses the real possibility that the body politic may develop the impression that chiropractic is not a real profession and that its members are not 'real doctors.' That impression would be just as ostracizing to chiropractors, regardless of where they practice, as official denunciation.

Closing thoughts
From our perspective, we submit that the ship of chiropractic homogeneity has left the harbor and it is impossible to cram the genie of divergent thoughts back into the bottle of unity. Despite the confusion it causes among governmental regulators, third party payers and patients, despite ongoing and often pointless internal fighting and despite the fact that some chiropractors, when asked to discuss the behaviors of their colleagues of different stripes are just as likely to circle the wagons and shoot forwards as they are defend each other, despite all this, it seems to us that the future is diverse.

From a strictly pragmatic perspective, we submit that chiropractic's diversity is here to stay and is not likely to be a harbinger of its demise. Lackng a compelling body of literature that instructs us of what is the most effective technique to use under this or that clinical scenario, taste and judgment will, by necessity, result in different opinions, creating a profession more chimerical than uniform in appearance. However, with such wide and diverse clinical acumen comes great professional responsibility. When we look at the issue in its entirety, we think that the profession can survive its technique diversity and chimerical nature if it can exert control over those members at the periphery of reasonable conduct. The challenge is to weed out the wheat from the chaff and not let chiropractors at the fringe of ethical behavior hold the remainder of the profession for ideological ransom.

References
What should be the Roles of Plain X-ray and Other Imaging Modalities in Chiropractic Education Today? What is the Evidence, what are the Trends, what Recommendations does the Conference have?

Background Paper (1)
Craig Moore DC

Chiropractors’ Association of Australia, Australia

Introduction:
Arthritis and musculoskeletal conditions are the largest cause of disability in modern economies around the world. Australian figures specific to this national health priority reveal that 6.3 million Australians (31%) suffer within this health domain, one that absorbs 9.2% of total health expenditure ($4.6 billion) and only less than cardiovascular disease (10.9%) and diseases afflicting the nervous system in cost to the health-care purse. ¹

There is a need for future chiropractic clinicians to have the diagnostic skills necessary to better assess risk factors related to the cause and the progression of a wide range of degenerative joint conditions. There is a growing need to implement strategies for the improved management of these risk factors.

Within this billion-dollar health domain, the chiropractic profession and diagnostic imaging is strategically positioned to play an important role in the diagnosis and measurement of progressive and degenerative alignment-based conditions of the human spine. This positioning may further advance future students as non-surgical spine-care experts and see the implementation of the more effective preventative and management strategies within these populations.

Background:
There is evidence within the literature that, separate to genetic and occupational factors, abnormal joint load bearing is a significant risk factor for pain, loss of joint function and degeneration at the segmental spinal level. ²-⁸ Of greater interest to imaging-informed care is the mounting evidence that abnormal regional and global spine patterns contribute to abnormal segmental load bearing and the resulting adverse health effects. ⁹-³³ Beyond pain, disability and disc disease, abnormal spine posture (lordosis, kyphosis, scoliosis and sagittal balance) contributes to other costly health issues including headache ³⁴, ³⁵ and falls risk within older populations. ³⁶-³⁷

Abnormal regional and global spine alignment are an increasing focus in orthopedic and surgical literature with “The Importance of Lumbar Lordosis” the central theme of the Spine Society of Australia annual scientific meeting in 2011. Of interest within chiropractic education is the growing recognition of non-surgical spine-care toward the management of these postural conditions. There is a growing number of studies specific to the non-surgical management of cervical, thoracic and lumbar spine regional
alignment. There are a number of studies recognizing the non-surgical management of multi-region (global) spine alignment such as scoliosis and short-leg conditions.

There is some evidence that spine contours can be assessed without imaging-based biomechanical measurement. What may be more significant to imaging education is the large number of studies finding physical examination and surface measurements to lack the validity and reliability of diagnostic imaging for this diagnosis and measurement. Diagnostic imaging may have an important place for future clinicians who seek to provide more effective protocols specific to the care and management these conditions. Can students otherwise proceed with optimal care for conditions they cannot see without imaging?

Balancing the Risks of Ionization Radiation

Within the Australian Radiation Protection and Nuclear Safety Agency (ARPANSAS) code of practice for the application of ionizing radiation points (a) to (g) provide some guidance specific to this discussion. The “justification of a medical radiation procedure in determining the net benefit from a medical radiation procedure, the radiation medical practitioner must take into account:

(a) the specific objectives of the procedure;
(b) the characteristics of the individual patient involved;
(c) the total potential clinical benefits, including the direct health benefits to the patient and, where relevant, the benefits to society in general;
(d) the individual detriment to the patient that may result from the procedure;
(g) the efficacy, benefits and risk of available alternate techniques having the same objectives with less or no exposure to ionizing radiation.”

Within this context clinicians are required to take an “evidence-informed” approach to clinical decision-making in relation to all aspects of the patient examination and care. Clinicians must take an evidence informed approach toward the “specific objectives of an x-ray procedure” based on the “the characteristics of the individual” patient while taking into account other more or less reliable diagnostic techniques “that may (or may not) meet the same objectives.”

Radiation authorities recognize the “continuing scientific uncertainty about the effects (of radiation) at low doses” with “little or no epidemiological evidence of the health effects.” It further notes that “while the detriment of doses below 100 millisevent remains unclear caution must remain regarding the decision for diagnostic imaging.” Clearly, further analyses is still needed to provide more objective rather than theoretical evidence specific to the potential harm of low level ionizing radiation.
Conservative estimates regarding standard radiographic examinations have effective
doses (and potential detriment) that vary between 0.01–10 mSv, a range considerably
below 100mSv.98 Another recent study examining dose from a single lateral cervical
spine radiograph in chiropractic practice estimated the level to be as low as only 0.013
mSv, or about two days’ naturally occurring background radiation. 99 Another
government information site estimates an entire cervical spine series to be as low as
only 0.1 millisievert.100

Balancing the costs of imaging
How do educators position the role of imaging in the detection and measurement of
findings relevant to costly and progressive regional, global and pelvic structural
anomalies? Can diagnostic imaging play an important role in the growing public health
imperative to use the best available skills for both the assessment and subsequent
intervention of these conditions? What level of evidence is necessary to substantiate
teaching students that improved outcomes and reduced long-term health-care costs
may result from diagnostic imaging within these sub-groups? What might be the future
direction of research to better position chiropractors as the non-surgical spine-care
experts within this health domain? There are both individual studies and one systematic
review that has examined and assessed the unnecessary costs associated with spinal
imaging. These studies identified that imaging fails to contribute to higher quality care
or better outcomes specific to the management of acute back pain.101-103 There are
limits however in how broadly we might apply a data set that is specific to single
outcomes within the context of a range of complex patient findings. Some imaging
studies may be inadequate in answering all of the relevant evidence that sits before our
future clinicians.

For example, cost related studies are yet to factor in the potential savings long-term,
should timely imaging lead to more effective management of sub-groups and
populations. What are the reduced costs associated with imaging-informed care long-
term? What may be the savings associated with imaging-informed management
protocols that provide more effective preventative and management of conditions like
thoracic hyperkyphosis? Hyperkyphosis is a condition that may ultimately contribute to
costs associated with poor physical function, pulmonary compromise, increased falls,
fractures and even earlier mortality.17

Cost related studies have yet to factor in the costs associated with medico legal
litigation resulting from a failure to diagnose spine-conditions without diagnostic
imaging. One large survey has measured the concern for medical malpractice litigation
with 91% of physicians across a range of specialty lines practice defensive medicine by
ordering more tests than might sometimes be necessary to protect themselves from
lawsuits. The survey revealed no statistically significant differences among the clinicians
surveyed with regard to their sex, geographic location, specialty category or type of
practice.104 Can a complete examination of the financial burden of spine imaging be
limited to the initial upfront cost of the imaging alone?
The right study for the right question

The routine imaging of all new patients without any evidence-informed justification may not be an appropriate use of finite resources nor provide appropriate patient care. However, the studies and the criteria most appropriate to sub-groups within chiropractic imaging may need further examination. Further analyses may need to examine variables beyond the usefulness imaging provides to reducing back pain alone. Imaging trends within chiropractic may need to consider contraindications specific certain physical-care protocols. Imaging trends may not be limited to the value it provides toward informing pharmaceutical-care or general physical therapy.

Summary:

DL Sacket, the father of evidence-based medicine provides that “all levels of evidence and clinical experience should be considered in patient assessment”. Sacket states that “EBM not be restricted to randomized control trials and meta-analysis. Evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research. By individual clinical expertise, we mean the proficiency and judgment that we individual clinicians acquire through clinical experience and clinical practice”. 105

There are a growing number of non-randomized and randomized control trials specific the non-surgical management of respected regional, global and pelvic alignment-based conditions. Identification of these findings may require radiographic biomechanical analysis.

The imaging requirements of patient sub-groups and clinical decisions specific to certain chiropractic interventions may be excluded by more restrictive radiography recommendations. To date international chiropractic x-ray guidelines have provided different inclusion criteria regarding some of the spine-based health issues discussed within this article. 106-107 The latter however does acknowledge, “guidelines do not address all possible conditions associated with musculoskeletal disorders, only those that account for the majority of initial visits to a practitioner. Like other diagnostic tests, imaging studies should only be considered if (a) they yield clinically important information beyond that obtained from the history and physical examination; (b) this information can potentially alter patient management and; (c) this altered management has a reasonable probability to improve patient outcomes”.

Chiropractic is a profession concerned with the diagnosis, treatment and prevention of a range of mechanical disorders of the musculoskeletal system with spine-care and spine-alignment at its historical centre. The profession has identified imaging as vital to the identification of red flags. Gaps do still exist within the literature regarding the wider role of diagnostic imaging. This article provides discussion on imaging trends specific to the diagnosis and measurement of spine-based risk factors to assist future clinicians in providing more effective management of the conditions within this costly health domain.
References

1. AIHW. Arthritis and musculoskeletal conditions in Australia 2005;CAT. NO. PHE 67(Arthritis series number 1).


58. Woggon D, G L. Scoliosis treatment using a combination of manipulative and rehabilitative therapy: A Retrospective case series BMC Musculoskeletal Disorders. 2004;Sep;14(5;5;32).


96. Australian Government. Australian Radiation Protection and Nuclear Safety Agency Radiation Protection in the Medical Applications of Ionizing Radiation (ARPANSA) Canberra: Chief Executive Officer of ARPANSA; 2008. Section 3.2.2 p. 3


106. Deed E, Harrison, Donald D. Harrison, Christopher Kent, Joseph Betz, Paul A. Oakley. PCCP Guidelines http://www.pccp.org/preface.htm

What should be the Roles of Plain X-Ray and Other Imaging Modalities in Chiropractic Education Today? What is the Evidence, what are the Trends, what Recommendations does the conference have?

Background Paper (2)
Craig Moore DC
Chiropractors’ Association of Australia, Australia
Kenneth Young DC
Murdoch University, Australia

Application of “Less Is More” to Low Back Pain
Susha V. Srinivas, MD, MPH; Richard A. Teo, MD, MPH; Zachary E. Berger, MD, PhD

An initiative of the National Physicians Alliance, the project titled “Promoting Good Stewardship in Clinical Practice” developed a list of the top 5 activities in primary care for which changes in practice could lead to higher-quality care and better use of finite clinical resources. One of the top 5 recommendations was “Don’t do imaging for low back pain within the first 6 weeks unless red flags are present.” This article presents data that support this recommendation. We selectively reviewed the literature, including recent reviews, guidelines, and commentaries, on the benefits and risks of routine imaging in low back pain. In particular, we searched PubMed for systematic reviews or meta-analyses published in the past 5 years. We also assessed the cost of spine imaging using data from the National Ambulatory Medical Care Survey. One high-quality systematic review and meta-analysis focused on clinical outcomes in patients with low back pain and found no clinically significant difference in pain or function between those who received immediate lumbar spine imaging vs usual care. Published data also document harms associated with early imaging for low back pain, including patient labeling, unneeded follow-up tests for incidental findings, radiation exposure, unnecessary surgery, and significant cost. Routine imaging should not be pursued in acute low back pain. Not imaging patients with acute low back pain will reduce harms and costs, without affecting clinical outcomes.

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See also pages inc 120029 and 120025

METHODS

A detailed description of the methods used to derive the top 5 lists is given elsewhere. The full text discussion herein for internal medicine was reworded as follows: "Don’t do imaging for low back pain within the first 6 weeks un-
low back pain. Red flags were defined as "severe or progressive neurological deficits" or serious underlying conditions, such as cancer or osteomyelitis.

We searched the recent literature for population-based estimates of the incidence of acute low back pain, the frequency of physician visits for this problem, and the use of imaging. To document the potential benefits and risks of routine imaging for acute low back pain, we searched the literature using PubMed for articles published in the past 5 years using the terms "lower back pain", "low back pain", "imaging", and "clinical outcomes related to imaging of acute low back pain." This meta-analysis, by Chou et al., focused on clinical outcomes in patients with acute low back pain and found no clinically significant difference in pain or function between those who received immediate lumbar spine imaging and those who did not (Figure 1). The authors concluded that "lumbar imaging for low back pain with or without imaging does not improve clinical outcomes." 12(12)

EVIDENCE OF BENEFIT

Our literature search identified only one systematic review published in the past 3 years that provides data on outcomes related to imaging of acute low back pain. This meta-analysis, by Chou et al., focused on clinical outcomes in patients with acute low back pain and found no clinically significant difference in pain or function between those who received immediate lumbar spine imaging and those who did not (Figure 1). The authors concluded that "lumbar imaging for low back pain with or without imaging does not improve clinical outcomes." 12(12)

EVIDENCE OF HARM

More than 80% of patients seen at primary care practices have low back pain that cannot be attributed to a specific disease or anatomic abnormality, and it is well known that imaging of asymptomatic patients often reveals anatomic abnormalities, such as herniated discs. 13(13) One of the risks of routinely imaging uncomplicated acute low back pain is patient "labeling": no evidence exists that labeling patients as having low back pain with a specific anatomic diagnosis improves outcomes. Degenerative disc disease is associated with low back pain, although the strength of the association varies with the definition. 14(14) In a study by Chou et al., patients with back pain who underwent MR imaging and were randomized to (1) disclosure of MR imaging findings to the patient and physician or (2) withholding of the findings, patients who were told that the MR imaging showed benign degenerative disc disease had a diminished sense of well-being compared with patients who were not told their MR imaging results.

In another study, patients who underwent lumbar radiography for back pain of at least 6 weeks' duration reported more pain and worse emotional health 6 months after back pain than those who did not undergo radiography. The patients who underwent imaging also were more likely to seek follow-up care.

The performance of MR imaging for acute low back pain may be associated with deleterious outcomes. In a randomized controlled trial comparing MR imaging with standard lumbar radiography for low back pain, patients in the MR imaging arm of the trial were more than twice as likely to undergo surgical intervention than patients in the lumbar radiography arm (risk difference, 0.34; 95% CI, -0.06 to 0.73). For work-related acute low back pain, another study found that patients who underwent MR imaging within the first month had more than an 8-fold increased risk for surgery and more than a 5-fold increase in subsequent total medical costs compared with matched control patients who did not undergo early MR imaging. Regions with higher use of advanced imaging for low back pain also have an increased rate of spinal surgical procedures for low back pain; greater use of imaging is not associated with better patient outcomes.

Other risks of routinely imaging patients with acute low back pain include unnecessary irradiation exposure (for lumbar radiography and CT), especially in women, for whom lumbar radiography poses a risk to reproductive health. Based on the performance of 2.2 million lumbar CT investigations in the United States in 2007, a study projected an additional 1200 future cases of radiation-induced breast cancer.

BALANCE OF BENEFIT AND RISK

High-quality consistent evidence shows that imaging patients with acute low back pain of less than 6 weeks' duration and no red flag symptoms results in no clinical benefit but is associated with harms, including patient labeling, irradiation exposure, and unnecessary surgery. As already summarized, recent reviews showed no improvement in clinical outcomes as...
Figure 1. Improvement in pain (A) and function (B) among patients with low back pain who received immediate lumbar imaging (intervention) vs usual care (control). Adapted from Chen et al. with permission from the publisher. CT indicates computed tomography; MR, magnetic resonance; RDS, Retired-Morris Disability Questionnaire; VAS, visual analog scale.

Figure 2. Estimation of patients receiving routine imaging for low back pain in 1 year.

We estimated the number of patients in 1 year receiving routine imaging for low back pain based on estimates by Deyo et al. that half of all US adults have an episode of acute low back pain during any given year. We also used estimates from the 2008 National Ambulatory Medical Care Survey to find that, among all patients undergoing imaging within 28 days of diagnosis, 11.8% received MR imaging in CT, and 88.2% received lumbar radiography. Figure 2 summarizes the calculation to estimate that 3.802,800 patients receive imaging for routine low back pain in 1 year.

We used 2009 Medicare reimbursements for lumbar spine imaging ($41 for plain radiography, $66 for CT, and $80 for MR imaging) as the cost of care for lumbar spine imaging. Non-Medicare patients are estimated to have a 75% higher rate of imaging. Based on our calculation, the estimated cost of care for lumbar spine imaging in 1 year is $1,079,709,000 (Table 2). Based on a $5,000 administrative fee that hospitals charge for all imaging, and a 50% Medicare reimbursement, $2,500,000,000 (Table 2) is the cost of care for lumbar spine imaging in 1 year.

Estimated Cost Savings of the Good Stewardship Recommendation

Based on the following assumptions, we estimated the cost savings that would accrue from avoiding routine imaging of low back pain.

- We estimated the number of patients in 1 year receiving routine imaging for low back pain based on estimates by Deyo et al. that half of all US adults have an episode of acute low back pain during any given year.
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phy, $2,604 for noncontrast CT, and $4,359 for noncontrast MR imaging) to calculate the associated cost savings per patient per year. Using the figure in the previous paragraph of approximately 4 million patients, we estimated that following the Good Stewardship recommendation would result in annual savings of $1.4 billion from the elimination of unnecessary lumbar radiography and between $1.20 and $200 million from the elimination of unnecessary MR imaging and CT. Using the midpoint of the range of savings for MR imaging or CT ($160 million from eliminating CT/MRI + $140 million from eliminating plain films), we arrived at our final estimate of almost $300 million in annual savings.

The cost savings and estimates discussed herein are based on generalizations about the US population at large and do not consider regional variability or differences in imaging use according to practice size and population. In addition, these estimates ignore the societal cost of imaging, including the morbidity associated with patient labeling or the risk for unnecessary surgery.

**COMMENT**

**CHANGING BEHAVIORS OF PHYSICIANS AS STEWARDS**

Ample evidence supports the National Physicians Alliance recommendation that in the absence of red flag symptoms imaging is not warranted in acute low back pain of less than 6 weeks' duration. Similar guidelines that recommend against routine imaging have been in use for almost 3 decades. Nevertheless, a survey of US physicians found that more than one-third would order lumbar MR imaging for uncomplicated acute low back pain if a patient insisted on it even after the physician explained that it was unnecessary. 21

Reasons why physicians may continue to order imaging for acute low back pain include medicolegal concerns, patient preferences, time pressures (which might make it easier to order an imaging procedure than to discuss the condition), and financial incentives. In randomized controlled trials, 19 patients with low back pain expressed more satisfaction when they received routine lumbar imaging or advanced imaging, although clinical outcomes were not better than those for patients who did not undergo imaging.

How can physicians say no and still maintain the physician-patient relationship, a high level of patient satisfaction, and patient adherence? Physicians are cautious when rejecting patient requests for service, in part because of the perception that saying no to a request may lower patient satisfaction. 24 However, most patients do not want unnecessary or potentially harmful tests, and patient education may bridge this gap. 25

Evidence has shown that patient agreement with his or her physician can predict important health outcomes. A study 26 using a specific 3-item instrument in assessing patient agreement with the plan by the physician for their low back pain showed that higher agreement scores correlated with increased patient satisfaction and with improvement in measures of health status at 12 months' follow-up. Data suggest that validating a patient's diagnosis of low back pain, gathering additional data about the reason the patient is requesting imaging, and providing information tailored to the patient's perspective may result in excellent patient satisfaction, despite denying the request for imaging. 27

Strategies involving physician education by clinical leaders, audit, and feedback may be effective in reducing inappropriate lumbar imaging. 28 A multifaceted intervention in a health care system reduced the rate of lumbar MR imaging by 23%; this program required clinicians to identify an approved indication before ordering advanced imaging, offered education on appropriate imaging, included periodic audits and feedback, and provided rapid physical therapy and consultation when imaging was not indicated. 29 Computer-based feedback on recent imaging investigations and ordering patterns of peers may also have some influence on the requesting of imaging tests. 30 Some observers have recommended mandatory consultation by a radiologist when physician requests for imaging are inconsistent with guidelines. 31 Effective intervention to reduce inappropriate imaging probably requires multiple simultaneous strategies.

Although physicians are usually loath to bring up the issue of cost in the examination room, today's health care climate may make this topic ripe for discussion. Pearson 32 discusses the need for a shift in the paradigm of physician advocacy to one in which patients and physicians are part of a moral community that controls costs through group deliberation and decision making. An ethical grounding has recently been emphasized by the American College of Physicians, which included such considerations as part of the professional responsibility of physicians. 33 Honesty about cost can increase patient satisfaction in the delivery of high-quality clinical care.

**FINAL THOUGHTS**

The "Less Is More" series is focused on areas in which responsible physician stewardship can help improve the quality and reduce the potential harms of care. Physicians should also consider costs, balancing the needs of individuals with those of society at large.

We believe that a thoughtful, dispassionate approach to topics in medicine can reveal areas of practice that may have become standards of care but are not necessarily good standards of care. The Good Stewardship Working Group found that collaborative deliberation and decision making, together with a thorough study of the medical literature, can help physicians explain their rationale for evidence-based selective imaging.

Adhering to the Good Stewardship recommendation on low back pain will improve care, reduce harm, and decrease overall medical costs. Ensuring a frank and honest discussion of the benefits and risks of medical therapy and imaging can improve care and reduce costs for patients with low back pain.
Role and Application of Simulation in Clinical Training. Does it Work? What are the Models? What does the Evidence Show?

Background Paper (1)
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ORIGINAL ARTICLES

Manikin-Based Clinical Simulation in Chiropractic Education

Marion McGregor, DC, PhD, and Dominic Giuliano, DC, Canadian Memorial Chiropractic College

Objective: The purpose of this pilot investigation was to describe the development and implementation of simulation exercises and evaluate the feasibility, satisfaction, and relative effectiveness of a manikin-based simulation program in chiropractic undergraduate education. Methods: This investigation consisted of (1) a qualitative review of other simulation environments and evaluation of related simulation literature to develop the educational processes to be used, (2) implementation of simulation scenarios for 15 student interns and their 11 supervising clinicians, and (3) implementation of simulation scenarios in a random sample of 63 1st-year and 24 2nd-year chiropractic students. Assessment of success was based on results from satisfaction and usability questionnaires and perceived achievement of learning outcomes. Anxiety scores were measured for all participants via a visual analog scale. The level of successful integration of simulation-based science material was assessed using a test comparing test results between students who participated in the pilot and those who did not. Results: Implementation methods were developed on the basis of qualitative investigation. Simulation program feedback from all participants indicated high levels of satisfaction, feasibility, and perceived achievement of learning outcomes. Anxiety levels among interns differed according to role chosen (p = 0.07, p = 0.00). Mean difference in course examination scores of students who participated in simulations versus those who did not was 2.25% favoring students who participated (p = 1.00). Conclusions: High levels of student satisfaction and perceived achievement of learning outcomes were consistently achieved. A trend toward successful integration of basic science knowledge provides reason for cautious optimism. More research is recommended. (J Chiropr Educ 2013;27(1):14-23)

Key Indexing Terms: Chiropractic; Education; Manikin

INTRODUCTION

This pilot project is intended to add to current knowledge in chiropractic education by providing data related to our chiropractic college’s initiation of manikin-based simulations to facilitate clinical and basic science learning. Review of the literature indicates that this is the first study of the use of such simulations in a chiropractic setting. Because information regarding the use of simulation technologies in chiropractic colleges has not been available to date, this report has three aims:

1. To describe the development of the simulation learning program;
2. To describe the implementation of the simulation experiences; and
3. To provide pilot data regarding the feasibility, satisfaction, and relative effectiveness of such a program for inclusion in the chiropractic curriculum.

Educators in health care are challenged to provide uniform, case-based, real-world experience to all students when considering the diagnosis and care of patients with complex and rare conditions. In an effort to face this challenge, simulation environments using technically sophisticated, life-size manikins have been created for use in medical, nursing, and paramedic schools.
The success and popularity of simulation programs in health care, as well as the educational theories on which they are based, have led to a Best Evidence Medical Education (BEME) Collaboration effort to characterize the important features of simulation experiences that lead to effective learning. The BEME “involves an international group of individuals, universities and organizations (e.g. Association for Medical Education in Europe (AMEE), Association of American Medical Colleges (AAMC)), committed to moving the medical profession from opinion-based education to evidence-based education” and can be likened to the Cochrane Collaboration for clinical care. The BEME review of simulation-based learning concluded that while more rigorous research is required, clinical simulation exercises are effective. The evidence-based features associated with effective learning (largest preponderance of best evidence to smallest) from that review are listed as follows:

A. Providing feedback
B. Repetitive practice
C. Curriculum integration
D. Range of difficulty for simulations
E. Multiple learning strategies used
F. Clinical variation captured
G. Controlled environment
H. Individualized learning
I. Defined learning outcomes
J. Simulator validity

Such simulation environments have not been documented in chiropractic educational institutions for the teaching and learning of complex cases that may enter the future chiropractor’s office environment. Dr. Roger Kneebone, once a general surgeon and now famous for his work at the Imperial College, London, in simulation and the contextualization of clinical learning, speaks of simulation in health care as

...a safe space which can reflect the uncertainties of clinical practice and recreate the conditions of real-world learning. By reintroducing complexity and human unpredictability, simulation can provide a safe environment for avoiding the transformational change that is essential to becoming a competent clinician. (p. 954)

The foundational constructs to professional health care education via mankin-based simulation is grounded in a tremendous number and wide variety of learning theories. These include reference to Kolb's learning cycle from 1984 (wherein a feedback loop exists between abstract conceptualization, active experimentation, concrete experience, and reflective observation), as well as sociocultural learning theories related to horizontal integration, whereby, as pointed out by Griffiths and Gule, learning in work-based contexts allows students to practice actively extracting from their academic knowledge the relevant facts and issues to be applied in the workplace.

Of particular relevance to the methods involved in the simulation process considered for this pilot study is Atherton’s “know/don’t know cycle,” wherein finding a safe way to help a student understand and appreciate his or her lack of knowledge and clinical skill can be very helpful in claiming the student’s attention necessary to facilitate the transfer of knowledge and skill.

In evaluating the many theories related to simulation learning methods, Gordon and colleagues have conceived of a “unifying theory of cognitive and emotional learning” (p. 370). This approach, like the notion of sociocultural learning, recognizes the impact of the environment and includes those social interactions that would be expected to occur if the clinical experience happened in real life. Emotion is viewed as a catalyst for learning with the recognition that an actual personal encounter with a single case can generate a memory that shapes future practice. Immersion into a complex simulated, clinical scenario is viewed as a means to accelerate the development of expertise in students who are naive to the subject matter, but for whom later lectures are likely to hold greater relevance as a result of the experience. The simulation program that was developed incorporated the theoretical notions described above as well as the features of the BEME review.

METHODS

This pilot investigation was approved by our chiropractic college’s research ethics board (REB#1007X09) and was conducted in three phases. The first was the development of the mankin-based simulation experience based on theory and best practices. The second was the study of implementation of the simulation experiences to the senior students early in their clinic-based program. The third was evaluation of the implications of providing simulation experiences to more junior students and assessment of the impact on the learning of relevant basic science material in the curriculum.
Part I: Simulation Learning Experience
Process Development

Ten interested faculty and administration volunteers formed the development team to investigate Simulation Lab experiences. Four members of the team were primarily teaching faculty. Five members were primarily involved in administration. One of the five administration members had particular expertise in curriculum and faculty development. That member joined the team to provide input and guidance related to intended educational learning outcomes and objectives. The final member was the school counselor. Given the perceived value of emotion as a catalyst for learning in simulated environments, the school counselor’s expertise in providing an understanding of the management of emotions in this environment and as a liaison for unanticipated student responses was considered important.

Team members met on a regular basis throughout a 1-year period. Action plans were developed to gather knowledge related to manikin choice, environmental needs (eg, space requirements and camera and microphones for recording simulation sessions), scenario development, and learning outcomes. Team members visited medical, nursing, and paramedic environments already using simulations and scenarios, and two team members attended the first of a series of three educational programs leading to a simulation-based educational certificate.

Scenarios for simulation experiences were observed in the medical, nursing, and paramedic community. Experience in scenario development was gained during the educational program attended by two of the team members. In order to be certain that the scenarios chosen would be of importance to the chiropractic profession, the local Canadian malpractice insurance agency was contacted. Discussions regarding old case files and the opportunity to reproduce situations that had actually occurred in chiropractic offices provided key input to the scenarios chosen for elaboration and considered for future development of the simulation lab.

For each full scenario, related learning objectives were developed. In addition, the team created a video recording of each scenario, casting themselves in the various roles relevant to the case. This was to be used as a reference tape for feedback during student learning. Finally, relevant members of the basic and clinical science faculty were contacted and asked to evaluate each scenario and provide appropriate scientific content for use during student debriefing periods in the proposed simulation experience.

Part II: Implementation of Simulation Experiences Into Senior Student Year

Students entering their senior year at our college were provided with simulation experiences within the first 3 months of beginning their first rotation in the main campus clinic. Results from part I were used to guide these experiences. During the clinical year, students are grouped in “pods” of 8 to 10 students per licensed clinician. To ensure that each student had the opportunity to participate in the simulation lab, each pod and its clinician were scheduled for a simulation experience during the pod’s normally scheduled 2-hour administrative time. Clinicians responsible for the pods were given a prelab orientation that included the information on the intent of the experience and the nature of the formative learning process it applied to the environment.

The simulation experience chosen for this pilot study was a myocardial infarction progressing to arrest, occurring before a chiropractic treatment but during a patient examination for back pain. A life-size Gaumnard (Hal S3000 or Susie S2000) manikin was used as the patient. The acting coordinator of the simulation lab provided the voice to the manikin and operated the computerized physiology to progress the patient to an arrest.

The simulation environment was set up to look like a chiropractic office. Students within the pod each chose their identity (doctor, spouse, receptionist, waiting room patient, patient in next room, etc) by selecting a clipboard with a concealed role on it. Students had no information regarding the case that would be used, or the role that they would play, before entering the simulation environment. On completion of role selection, the acting coordinator briefed each student individually regarding the intent of his or her role. This included, for example, explaining to the student that his or her persona was to persist in asking questions from a layperson’s perspective or that he or she was to become very emotional as the scenario unfolded. There was no collaboration between students before the onset of the experience. Students were also not made aware of what the scenario with the patient would be.

In recognition of the role that emotion may play in learning, throughout the simulation experience, students were asked at eight different time points to rate their level of anxiety on a 100-mm visual analog...
scale. Those time points were (1) upon entering the lab, (2) after discovering the role they had chosen, (3) after the initial briefing, (4) after the first attempt at the scenario, (5) after the first debriefing, (6) after the second attempt at the scenario, (7) after the second debriefing, and (8) just before leaving the lab.

At the end of the experience, students were also asked to complete a learning outcomes survey, a modified version of the System Usability Scale15,16 and a Satisfaction Questionnaire fashioned after the work of Morgan and Cleave-Hogg17 and modified to include a question regarding comfort from the work of Peckler et al.18 Descriptive statistics were used to summarize outcomes. Analysis of variance was used to determine if the overall anxiety level (that is, the average of all eight anxiety scores) of students was different depending on which role they chose while having the simulation experience. Each student had one complete simulation experience and only played one role in that experience. For this analysis, therefore, there was one summary anxiety score per student.

**RESULTS**

**Part I: Simulation Learning Experience Process Development**

The simulation development team identified a total of 16 complex or serious cases that could be based on actual occurrences in chiropractors’ offices and that would be appropriate for the learning needs of the students involved. These were prioritized and the first four reference tapes based on these cases were recorded. In addition, for all four reference-tape scenarios, relevant faculty provided appropriate content to be used for the debriefing periods (BEME Feature C).

Upon reviewing the BEME criteria, the information gained from other simulation sites and reviewing educational theory, the following steps (in sequence) were identified as comprising a complete simulation experience:

1. **Introduction to the Simulation Lab**: Before beginning the first scenario, students are given a brief tour of the Simulation Lab. During this portion of the experience, the rules of the lab are described, as is the intent of the scenario that they will be part of, and the purpose of the data collection. Students are asked to sign a Confidentiality Agreement and are further asked to consent to having the scenario and their performance videotaped.

2. **Briefing**: The students are provided with a general description of what a simulation scenario is and the roles that they may play in that scenario. The coordinator reviews the intended learning outcomes (BEME feature G).
Table 1. Level of satisfaction (% agree or strongly agree) with simulation experience

<table>
<thead>
<tr>
<th>Modified Simulation Satisfaction Questionnaire Items</th>
<th>Intern Response</th>
<th>Clinician Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Briefing phase introduction was helpful</td>
<td>95</td>
<td>11</td>
</tr>
<tr>
<td>2. Understood the purpose of this experience</td>
<td>95</td>
<td>11</td>
</tr>
<tr>
<td>3. Comfortable with the setting</td>
<td>95</td>
<td>11</td>
</tr>
<tr>
<td>4. Reflected a realistic setting</td>
<td>95</td>
<td>11</td>
</tr>
<tr>
<td>5. Reflected the learning objectives</td>
<td>95</td>
<td>11</td>
</tr>
<tr>
<td>6. Feedback was given</td>
<td>95</td>
<td>11</td>
</tr>
<tr>
<td>7. Learned something from experience</td>
<td>95</td>
<td>11</td>
</tr>
<tr>
<td>8. Might be used as an evaluation tool</td>
<td>95</td>
<td>11</td>
</tr>
<tr>
<td>9. Prior exposure needed before its use as an evaluation tool</td>
<td>95</td>
<td>11</td>
</tr>
<tr>
<td>10. Talking to the mannequin difficult</td>
<td>95</td>
<td>11</td>
</tr>
</tbody>
</table>

After Morgan and Cleave-Hogg17 and Peckler et al.18

3. Assignment of Role: Students choose their part by selecting a clipboard that has been turned over so as to conceal the role they will be asked to play (eg. doctor, spouse, receptionist, additional patient, etc.). Once a clipboard has been selected, a student must stay with that role.

4. Scenario Enactment 1: Students take their places in the scenario and role play the event. The purpose of this step is to "make learners aware of their ignorance" as proposed by Atherton14 (BEME features G, H, I).

5. Debriefing 1: Feedback is provided on doctor and group performance (BEME features A, E, I). This is a lengthy process that includes the opportunity for reflection by the student participants and an opportunity for the lab coordinator to demonstrate equipment and for students to try to work with the available equipment. Questions are answered and other questions are posed as needed to facilitate the learning outcomes. During this process, students view the reference tape and discussion continues regarding the actions taken in the tape and how those actions can be translated to the second scenario enactment.

6. Scenario Enactment 2: Students again assume the role they are assigned and redo the scenario (BEME features B, G, H, J). Small changes occur with other members of the team as they choose to play their roles in a slightly different manner as the second enactment unfolds (BEME Feature F).

7. Debriefing 2: Student groups have the opportunity to see the tape of their performance. Feedback is again provided and remaining questions are asked and answered. Students once again have the opportunity to reflect on their performance and consider how their experience could be expected to translate into an actual practice setting. In addition, students reflect on the expected learning outcomes and judge the extent to which those learning outcomes have been met (BEME Features A, E, I).

BEME feature C (curriculum integration) and BEME feature D (range of difficulty for simulations) were met through the development of the initial four reference tapes, the identification of additional reference tapes needed, and piloting the simulation scenarios to three of the four academic years with content relevant to both the clinical and basic sciences.

Part II: Implementation of Simulation Experiences Into Senior Student Year

A total of 95 interns associated with 11 clinicians (a total of 11 pods consisting of eight or nine students in each pod) participated in the pilot study involving the main campus clinic. As shown in Table 1, results indicated a high level of satisfaction with the experiences overall.

In addition, usability of the lab was also rated highly, as shown in Table 2.

With respect to the learning objectives, 37% of students perceived that at least one of the learning objectives did not apply to them because they were not in a role that would be expected to undertake that objective. For example, one learning objective was stated as: "Allowed me to accurately assess the patient’s condition." For that objective, only 71 out
Table 2. Level of usability (% agree or strongly agree) with Simulation Lab

<table>
<thead>
<tr>
<th>Adapted System Usability Scale Items</th>
<th>Intern Response</th>
<th>Clinician Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Would like to use the Simulation Lab frequently</td>
<td>95  88%</td>
<td>11  81%</td>
</tr>
<tr>
<td>2. Found Simulation Lab unnecessarily complex</td>
<td>95  2%</td>
<td>11  0%</td>
</tr>
<tr>
<td>3. Found Simulation Lab easy to use</td>
<td>95  81%</td>
<td>11  91%</td>
</tr>
<tr>
<td>4. Needs technical support person to use Sim Lab</td>
<td>95  40%</td>
<td>11  45%</td>
</tr>
<tr>
<td>5. Functions of Simulation Lab are well integrated</td>
<td>95  67%</td>
<td>11  100%</td>
</tr>
<tr>
<td>6. Too much inconsistency in Sim Lab</td>
<td>95  11%</td>
<td>11  0%</td>
</tr>
<tr>
<td>7. Most people would learn to use lab quickly</td>
<td>95  83%</td>
<td>11  82%</td>
</tr>
<tr>
<td>8. Lab is cumbersome to use</td>
<td>95  4%</td>
<td>11  9%</td>
</tr>
<tr>
<td>9. Felt confident using Simulation Lab</td>
<td>95  48%</td>
<td>11  84%</td>
</tr>
<tr>
<td>10. Needed to learn a lot before could get going with Sim Lab</td>
<td>95  8%</td>
<td>11  9%</td>
</tr>
</tbody>
</table>

After Lewis and Sauro.16

Figure 1. Anxiety levels (as measured by visual analog scores out of 100) for eight time points, by role in simulation. Note: “Clinician” refers to a licensed chiropractor observing the simulation experience and “doctor” refers to the student role chosen.

of 95 (75%) subjects responded with some level of agreement. Of those 71 subjects, 83% agreed or strongly agreed that the objective had been met for them, regardless of the role they played in the scenario. The range of agreement that any individual learning outcome had been met was from 83% (described above) to 98%. Virtually all of the students responding (94/95) to the learning outcome that the Simulation Lab provided a safe environment within which they learned a relevant clinical crisis agreed or strongly agreed (98%) that that outcome had been met.

Anxiety levels were summarized by role and graphed over the eight time periods in which this outcome measure was taken during each simulation experience. These data are represented in Figure 1.

Analysis of variance on the average (over all eight time periods) anxiety score by role (excluding the clinician who did not play a role in the simulation experience) indicated a statistically significant difference in anxiety levels between roles ($F = 8.07, p = .001$). In particular, post-hoc testing using the Scheffe test indicated a statistically significant difference between students assigned to the role of doctor, compared to wife ($p = .04$), receptionist ($p = .03$), and the role of another patient ($p = .00$).
Part III: Providing Simulation Experiences Early in the Chiropractic Curriculum—Potential Impact on Basic Sciences

Sample sizes for the year I and year II students intended to participate in this pilot program were bounded by the class schedule and available time outside of the curriculum during the early part of the 2010–2011 academic year. No formal sample size analysis was conducted.

Of the 24 students randomly selected from the year II class for participation in the lab, a total of six students chose not to participate. Those students were replaced by convenience on the day of the scheduled simulation. Three students of the 35 from the year I class who were randomly selected for participation chose not to undertake the simulation experience. Those students were also replaced by convenience on the day of the scheduled simulation. An informal poll of students choosing not to participate indicated that they were unaware of the intent of the simulation exercise and had not paid attention to the e-mail regarding their participation.

Usability, satisfaction, and learning outcomes data from the 35 students randomly selected from the year I class and 24 students randomly selected from the year II class were descriptively evaluated in the same manner as intern data. Very similar levels of usability, satisfaction, and perceived achievement of learning outcomes were found.

In addition, the data from the year II group was compared with testing related to the basic science course that contained material relevant to the simulation experience. The distribution of grades for both students who participated in the experience and for those who did not was determined to be normal. The mean for the 165 students who were not part of the pilot study was 66.75% (SD 11.21) and the mean for the 24 students who did participate was 70.00% (SD 13.69). The mean difference between groups, therefore, was 3.25%. The t-test resulted in a t value of 1.28 and a subsequent p value of .20. Power was evaluated at 30%.

A separate two-tailed, unpaired t-test was conducted for the year II group, dividing the students into those who had been randomly drawn (n = 18) and those who had been replaced by convenience (n = 6). No statistically significant difference was determined (t = 0.23, p = .82).

DISCUSSION

Providing health care students the appropriate quality and quantity of clinical apprenticeship is an ongoing challenge to their education. As discussed by Seabrook,19 apprenticeship learning and teaching can be considered “diffuse, unbounded and opportunistic” (p. 667). Concerns around lack of standardization due to variability in mentorship, disparity of goals, and the haphazard nature of presenting clinical conditions have a long history.20-22 This challenges the notion that the typical apprenticeship model provides sufficient and consistent training in complex clinical cases that are important to see in a contextually related clinical environment. Gorman and colleagues22 suggest that this historically revered form of training is likely to rely more on technology in the future.

In chiropractic education, it has been observed that the apprenticeship-based clinical experience received by interns before graduation is less than that of their medical counterparts.23 As noted by Coulter and colleagues, when the actual number of hours spent intentionally teaching the clinical sciences are calculated, the professions’ hours dedicated to clinical care are more similar.23 This understanding, however, does not speak to the need for a more standardized experiential learning environment intended to integrate student knowledge from all levels as related to the complex clinical cases that may enter in search of care.

As pointed out by Brass,24 even greater emphasis is now being placed on experiential learning and apprenticeship-type education,25 with growth in the use of algorithm-based approaches suggested as being evidence based. Brass cautions, however, that training to the common clinical problems is problematic when interns and new clinicians are confronted with challenging and complex cases that necessitate moving outside of common algorithms. In such cases, students and clinicians alike must reach back to first principles and integrate basic science knowledge effectively in order to understand and appropriately manage a case. Simulation experiences have been suggested as a means of fostering such integration at the undergraduate level,30 while maintaining contextual relevance and facilitating the standardization of apprenticeship. Such methods have been tested successfully with respect to the preclinical use of toxicology.27
The purpose of this pilot investigation was to provide data for the implementation of manikin-based simulation experiences into the undergraduate curriculum at the chiropractic college. Simulation team investigation regarding the structure of other simulation environments, complex and challenging cases that had been documented as occurring in chiropractic offices, learning theory, and the BEME criteria resulted in the development of a seven-part learning experience. The average time required for each experience was 2 hours in length and debriefing included integration of knowledge from the undergraduate curriculum as well as discussion regarding legislation, jurisdiction, and professional behavior. The seven-part simulation experience represents a departure from other mechanisms observed by the development team either in training or through visitations, in that students are not informed about the clinical case they will encounter and a second opportunity after the first debriefing is provided so that students are able to reach a successful conclusion in the encounter. Further study is needed to determine if these theory-based factors make a significant difference to learning.

Data from the pilot study indicated high levels of usability and satisfaction among students using the lab at all academic levels. Low level of "confidence" (48% felt confident using the Simulation Lab) in lab usability is believed to be related to the relative lack of experience that students have had both with the clinical environment and with the technology itself. It is hoped that with additional opportunities in the Simulation Lab confidence will increase.

A majority of students indicated achievement of all learning objectives, although just over one-third of the students perceived that at least one of the learning objectives was not applicable to them based on the role they selected. Students who assumed the role of "doctor" in these simulations were more clearly able to rate their successful achievement of all learning outcomes.

In addition, it was observed that, initially, students selecting the doctor role had significantly higher levels of self-reported anxiety than students who had selected other roles. All students, however, were successfully able to manage their anxiety levels. Further, anecdotal reports indicated that by the end of the experience, students playing other roles requested opportunities to come back to the lab and assume the doctor role. Such requests were granted in the year by providing optional simulation opportunities.

Of particular interest was the notion derived from Gordon and colleagues that simulation experiences might be well placed in earlier academic years and that the emotional interest from those experiences may facilitate deeper learning. In the third part of this pilot investigation, students in the 1st and 2nd academic years were provided with simulation experiences suitable to their level of clinical development. Data from these experiences were consistent with results from interns. In addition, it was interesting to note that while not statistically significant, there was a 3.25% higher mean grade for 2nd-year students who had participated in the simulation experiences versus those who had not. This is especially intriguing since the provision of information from the simulation experience was not a direct match with the course material (which reflected only the basic science knowledge) and occurred approximately 2 months before the course content delivery by a lecturer who was unaware of the study. The relevance of a 3.25% change can be contextualized through the work of authors such as Schilharet and Pollock, who compared the clinical knowledge acquisition of nursing students when traditional clinical experience was contrasted with simulated experiences in a cross-over design. They noted that among their 74 students, both groups had significant gains in knowledge pre- to posttesting ($p = .015$), with pre- to posttest 1 mean knowledge scores of 3.05% for the simulation group and 2.11% for the traditional group. Our comparative results are still in line with anticipated changes from such an educational intervention and as such we suggest that this trend toward change is worthy of further investigation.

LIMITATIONS

There are, of course, limitations to this investigation. First, although the instruments used to gather data regarding both usability and satisfaction were based on previous studies, these questionnaires were adapted. Although face validity is evident, further reliability and validity testing on these instruments has not been completed. With respect to data regarding anxiety levels, a simple 100-mm visual analog scale was used. Although there are good data related to reliability and validity of the visual analog scale relative to pain outcomes, there are no such data related to anxiety. In this study we have assumed transference of acceptability.
for this instrument and that assumption may not be true.

Finally, relative to the evaluation of 2nd-year student study participant achievement on a related basic science examination, the sample size was clearly very small. In addition, six students were replaced from the random sample in a haphazard manner. It is understood that this may have biased the results. However, students selected in this haphazard fashion were not volunteers, nor particularly chosen. Rather, these participants were by happenstance, in a location near the Simulation Lab at the time the event was to occur. Regardless, the results from this portion of the pilot study, while encouraging, should be taken with caution until further more rigorous study is conducted with a larger sample size.

CONCLUSIONS

This pilot investigation provided encouraging data regarding the usability, satisfaction, and learning of students involved in simulation experiences that were included in their undergraduate curriculum. Anxiety levels, while initially high for students assuming the role of “doctor,” were managed without problem. Cautious optimism regarding the potential for greater integration of basic and clinical science learning through these simulation experiences appears warranted from the data retrieved through the study of year II participants. Further study, however, will be necessary to determine to what extent, if any, such results are generalizable. Nonetheless, the data from this pilot investigation provided sufficient information from which to integrate manikin-based simulation experiences into the formal curriculum in our educational environment.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

ACKNOWLEDGMENTS

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REFERENCES

KINETIC ANALYSIS OF EXPERTISE IN SPINAL MANIPULATIVE THERAPY USING AN INSTRUMENTED MANIKIN

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ABSTRACT
Objectives: The goals of this study were to measure the kinetic profile of thrust in different groups of subjects with various levels of expertise and to quantify general coordination while performing thoracic spine manipulations.

Participants: A total of 43 students and chiropractors from the Chiropractic Department of the Université du Québec à Trois-Rivières participated in this study.

Methods: Participants were asked to complete ten consecutive thoracic spine manipulations on an instrumented manikin. Peak force, peak force time to peak force, time to peak force, peak force variability, peak force variability, and force production and unloading time were compared between groups. Hand-eye delay obtained by calculating the temporal lag between the onset of unloading and the onset of peak force application was also compared between groups.

Results: No group difference was observed for the peak force, peak force variability, and peak force variables. However, group differences were present for variables like time to peak force, time to peak force variability, rate of force production, unloading time and hand-eye delay.

Conclusions: This study demonstrates clear differences between groups of subjects with different levels of expertise in thoracic spine manipulation. This study also demonstrates the usefulness of a simple, instrumented manikin in analyzing spinal manipulation and identify important parameters related to expertise (J Chiropr Med 2005;4(3):37-46).

Key Indexing Terms: Manipulation, Spinal; Professional Competence; Task Performance and Analytic Education

INTRODUCTION
There has been considerable progress in the development of new skills in spinal adjustment in the last century. A large number of colleges and universities throughout the world are now teaching various forms of spinal adjustment. Over the years, many different techniques of spinal manipulative therapy (SMT) have been used to give patients the most effective treatment.1,2 Chiropractic students learn to perform these adjustment techniques during their training. The process of learning implies an increased capability of performing skillfully in a particular situation.3 Thus, it implies that the practice goal for the learner in this task is to improve motor coordination and force application through practice to reach an adequate level of motor proficiency. Overall, the goal of SMT is to apply force and moment with specific parameters of direction, amplitude, and speed to a joint to deliver a biomechanical and/or neurological effect in the affected tissues.4,5 To acquire these psychomotor skills, students usually practice on human subjects to simulate the upcoming professional demands of their practice. Thus, understanding how students learn such techniques could potentially improve teaching methods and allow young trainees to deploy specific procedures that are the trademark of expertise.

A review of the chiropractic literature reveals a dearth of research in motor learning.6,7 However, in a recent paper, Scaringi, et al8 reviewed most of
the work on the applications of motor learning principles (knowledge of performance, knowledge of results, guidance hypothesis) relating to teaching chiropractic adjustments. Two lines of research are of particular interest to us: one of them refers to training devices to improve performance and retention of various chiropractic skills. Young et al. demonstrated the pertinence and effectiveness of a cervical manikin for the skill development of students practicing these procedures. In a blind review process, the examiner found no significant differences between the students who learned with the manikin alone and those who learned with the established approach on fellow students. Searling et al. also used a simulator in a thrusting maneuver (unilateral hypopharyngeal transverse procedure) with two predetermined force levels. Their findings suggest that once again the simulator is a valuable tool to improve learning of complex motor skills.

The other line of research in the chiropractic learning literature relates to quantifying differences in predefined biomechanical parameters of SMT by novice and practicing care providers. Cohen et al. designed their study to identify kinetic parameters that would show statistical differences between newly-trained and experienced care providers. For all kinetic measures (pelvic, upper-lower spine force), the mean values were higher in the experienced group, but did not reach the significance level because of large between-subject variability. Recently, Francou et al. addressed the issue of developing skilled performance in lumbar spine manipulation. The goal of their study was two-fold: it was designed first to quantify elements of performance in a specific spinal manipulation (unilateral manual-push procedure); and, second to test a learning strategy that combined rehearsal and quantitative feedback from an instrument measuring the application of axial forces against specific resistance levels. The subjects were divided into two experimental groups, one with standard training versus the other with standard as well as standardized training with a specific aid. Both groups were tested on three separate occasions at intervals of three months. The results revealed significant differences between the performance of the specific aid compared to the standard training group, particularly for preload, sagittal and lateral bending moments. These data were interpreted as supporting the use of training aids to enhance performance and improve learning. Some questions have been raised concerning the learning effects in this study. The targets for skill progression remain to be determined and are of great importance in the development of educational tools that will improve the SMT training of chiropractic students.

To perform SMT adequately, one must learn to control various force parameters, but also master overall body coordination to improve SMT efficiency. To address these issues, the goals of this study are to measure the kinematic profile of thrust in different groups of subjects with various levels of expertise and to quantify general coordination while performing thoracic spine manipulation. The main hypothesis of this study was that the experienced subjects will perform this SMT faster and with less variability compared to the inexperienced subjects.

**METHODS**

**Subjects**

A total of 43 students and chiropractors from the Chiropractic Department of the Université du Québec à Trois-Rivières (26.5 years, 25 men and 18 women) participated in this study. Four experimental groups were formed on the basis of experience in using SMT: second-year students (group 1), fourth-year students (group 2), final year interns (group 3), and chiropractors with at least five years of clinical practice (group 4). Two groups (second and fourth-year students) had experience limited to patient and chiropractor positioning during SMT, whereas the two other groups had respectively nine months and 13.2 (6.3) years of clinical experience. Subject characteristics for each group are presented in Table 1.

**Apparatus and Procedure**

A manikin used to teach cardiopulmonary resuscitation was modified and instrumented with a spring to simulate the resistance offered by a thoracic spine. Figure 1 illustrates the experimental set-up that simulates a thoracic posterior to anterior manipulation made on a prone-positioned patient. A strain gauge (Statham, Model UL 400, Oxnard, CA) was installed at the top of the spring that replicated the movement and resistance of the rib cage. The strain gauge was used for the recording of vertical forces applied by subjects on the contact point. To simulate the typical absolute movement of thoracic vertebra undergoing SMT, the manikin was modified to limit posterior to anterior movement to approximately 5 mm. This was done by mounting
an electromagnet at the base of the spring. The electromagnet was controlled by a variable current, which allowed the experimenter to modulate the level of maximal resistance offered by the spring. For this study, the resistive force was set to 475 N, slightly over the mean force normally applied in a typical thoracic spine manipulation generating audible release.\(^{15,16}\) Once this specified force level (475 N, measured on the strain gauge) was achieved by the subject, the electromagnet turned off while the force was continuously recorded. As a result, unloading of the spring and movement of the manikin torso surface simulated articular release characterizing vertebral joint cavitation.

For the experimental session, subjects were asked to complete ten consecutive thoracic spine manipulations on the manikin with a right-handed platform contact. This technique is called prone unilateral hypotensive transept adjustment.\(^2\) Participants were asked to use a posterior to anterior force vector without any other force component. The experimenters read the specific requirements of the task and answered questions before the practice trial. All subjects were specifically asked to complete their spinal manipulations with the minimum force required to obtain electromagnet release (475 N). All subjects completed three practice trials to gauge the level of resistance produced by the electromagnet. The practice trials were not recorded. They performed ten experimental trials without any feedback concerning their performance. During the experimental session, they stood on a force plate (AMTI, OSA-5, Watertown, MA) and used body positioning of their choice as long as they stayed on the force plate.

Data Analysis

For every trial, force applied to the manikin and vertical force from the force plate were recorded at a sampling rate of 600 Hz for 3 seconds. Force applied to the manikin and vertical force plate signals were filtered with a second-order Butterworth filter (7-Hz low-pass cut-off frequency). The following dependent variables were obtained from these two signals: onset of force, peak force applied, preload force and onset of unloading measured from the force plate. These variables were analyzed for each trial and every subject using private software (Analyse, Laval University). To determine unloading onset and onset of force, a moving algorithm was used. Following this, the data were then visually inspected to exclude any outlying data.

From these data, time to peak force, time to peak force variability, peak force variability, rate of force production and unloading time measured from the force plate were extracted and averaged for each subject. Time to peak force variability and peak force variability represents the average individual between trial variability (SD). Finally, hand-body delay was obtained by calculating the temporal lag between the onset of unloading and the onset of peak force application. When a subject makes a small amplitude downward movement (trunk or knee flexion), there is a negative acceleration of the center of mass and thus, for a short period of time, the vertical ground reaction force is less than the body weight. Until the subject applies forces on the manikin this unloading represents body motion to-
wards the force plate. The hand body delay variable was chosen to evaluate general coordination during SMT.

All dependent variables were found to be normally distributed and therefore submitted to one-way ANOVA (group factor). Since only interns and chiropractors had a regular practice of the thrust component of spinal manipulation, all dependent variables were also submitted to another one-way ANOVA (experience factor) where the two inexperienced groups of students were merged to form one group, while the chiropractors and interns were regrouped to form a second group. This analysis tested the effect of clinical experience (i.e., practicing or not practicing the thrust) When a main effect of group was observed, post hoc comparisons were performed by Tukey tests. For all analyses, statistical significance was set at p < 0.05.

RESULTS

Because the number of men and women were different in each group, ANOVA excluded the possibility of a confounding gender effect. For all dependent variables, ANOVA yielded no significant gender effect (p > 0.05). When the four groups were compared, significant group differences were observed for unloading time and hand-body delay (temporal lag between onset of unloading and onset of force application). The unloading time and the temporal lag between onset of unloading and onset of force application significantly decreased with experience (Fig 2). For unloading time, post hoc analyses revealed a significant difference between second year students and chiropractors and a significant difference between fourth year students and chiropractors. For hand-body delay, post hoc analyses revealed a significant difference between second year students and chiropractors. Table 2 presents the data for all dependent variables in all four groups.

When compared on the basis of clinical experience (groups 1-2 versus groups 3-4), significant experience differences were observed for time to peak force, time to peak force variability and rate of force production. Notably, significant experience differences were present for unloading time and hand-body delay, Figure 3 illustrates the mean and variability of ten trials for applied force and force plate data for one inexperienced subject (a) and (b) one experienced subject. These two subjects were chosen because they clearly illustrate the differences observed in unloading time, time to peak force and hand-body delay between the two groups.

Subjects without clinical experience showed longer time to peak force values, increased time to peak force variability and a smaller mean rate of force production. All these differences were statistically significant and are reported in Table 3. Figure 4 illustrates the time to peak force and rate of force production for both the inexperienced and experienced combined groups. No significant group or experience effect was noted for peak force, preload force, and peak force variability (p > 0.05; see Table 3).

DISCUSSION

In past years, clinicians and researchers have conducted a number of studies designed to characterize and describe the kinetics of high-velocity, low-amplitude spinal manipulation. Commonly, peak force, preload force, time to peak force and rate of force production are variables used to describe spinal manipulations in the scientific literature. In a previous study, Cohen et al. hypothesized that, for these variables, differences should exist between novice and experienced manipulators. However, they were unable to identify statistically significant differences between the two groups. The objective of the present work was to quantify the
Table 2: Mean (SD) Dependent Variable Values for All Groups

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
<th>P Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Force (N)</td>
<td>570 (27)</td>
<td>569 (26)</td>
<td>594 (25)</td>
<td>544 (20)</td>
<td>p = 0.675</td>
</tr>
<tr>
<td>Peak Force Variability (N)</td>
<td>53 (6)</td>
<td>41 (16)</td>
<td>45 (8)</td>
<td>44 (15)</td>
<td>p = 0.4</td>
</tr>
<tr>
<td>Preload (N)</td>
<td>31 (20)</td>
<td>41 (10)</td>
<td>77 (21)</td>
<td>57 (11)</td>
<td>p = 0.122</td>
</tr>
<tr>
<td>Time to Peak Force (ms)</td>
<td>171 (10)</td>
<td>156 (10)</td>
<td>156 (11)</td>
<td>140 (11)</td>
<td>p = 0.072</td>
</tr>
<tr>
<td>Time to Peak Force Variability (ms)</td>
<td>19 (2)</td>
<td>19 (2)</td>
<td>8 (12)</td>
<td>6 (12)</td>
<td>p = 0.29</td>
</tr>
<tr>
<td>Rate of Force Production (N/s)</td>
<td>3485 (279)</td>
<td>3884 (267)</td>
<td>4467 (202)</td>
<td>4217 (202)</td>
<td>p = 0.002</td>
</tr>
<tr>
<td>Unloading Time (ms)</td>
<td>253 (20)</td>
<td>231 (10)</td>
<td>191 (20)</td>
<td>152 (20)</td>
<td>p = 0.007*</td>
</tr>
<tr>
<td>Hand-O-Joy Delay (ms)</td>
<td>104 (19)</td>
<td>95 (19)</td>
<td>69 (14)</td>
<td>50 (16)</td>
<td>p = 0.035*</td>
</tr>
</tbody>
</table>

* Significant differences.

Motor learning of fast, simple movements has been studied extensively in the past. Generally, decreases in movement time and variability of movement parameters are taken as good indicators of motor learning. In the present experiment, two types of dependent variables were analyzed to determine the effects of experience on performance during thoracic spine manipulation. A first group of variables characterized motor performance of the subject on the basis of force amplitude. This group of variables included peak force and peak force variability as well as preload force. A second group of variables determined the temporal characteristics of SMT, time to peak force, time to peak force variability, rate of force production, unloading time, and hand-body delay.

The control of force and its variability are at the heart of several motor control models aimed at understanding skillful behavior. When a subject attempts to produce a given target force repeatedly, the between-trial variability of the force-time curve...
Table 3

Mean (SD) Dependent Variable Values of Combined Groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Groups 1-2</th>
<th>Groups 3-4</th>
<th>p Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Force (N)</td>
<td>166.5 (18.7)</td>
<td>166.4 (20.1)</td>
<td>p = 0.008</td>
</tr>
<tr>
<td>Peak Force Variability</td>
<td>400.6 (4.3)</td>
<td>440.7 (4.2)</td>
<td>p = 0.733</td>
</tr>
<tr>
<td>Preload (N)</td>
<td>36.8 (13.8)</td>
<td>67.3 (14.3)</td>
<td>p = 0.122</td>
</tr>
<tr>
<td>Time to Peak Force (ms)</td>
<td>159 (7)</td>
<td>159 (7)</td>
<td>p = 0.92*</td>
</tr>
<tr>
<td>Rate of Force Production (N/s)</td>
<td>55.9 (12.2)</td>
<td>42.7 (12.6)</td>
<td>p = 0.032*</td>
</tr>
<tr>
<td>Unloading Time (ms)</td>
<td>242 (14)</td>
<td>174 (14)</td>
<td>p = 0.001*</td>
</tr>
<tr>
<td>Hard-Rock Delay (ms)</td>
<td>97 (2)</td>
<td>59 (9)</td>
<td>p = 0.001*</td>
</tr>
</tbody>
</table>

* Significant differences.

Figure 4: Time to peak force (a) and rate of force production (b) for inexperienced and experienced subjects.

is often taken as a critical determinant of performance. In the present study, no group differences were observed for force amplitude characteristics. Peak force, within and between subjects variability were similar for all levels of expertise, indicating that these kinetic parameters are easily acquired by both inexperienced and experienced manipulators. This result is not surprising since a prone-axial manipulation is a relatively simple movement in terms of force application. The peak force needs to be applied with a quick rise and fall over time in one direction. Ghibaudo and Ghezzi have shown that, over a short period of learning in a simple isometric task, there is a significant decrease of peak force variability (less than 100 trials). It can be hypothesized that for more complex SMTs (safe posture lumbar and pelvic manipulation) the level of expertise would influence the peak force variability.

Preload force is defined as the quasi-static load applied to the segment to be manipulated in the same direction as the intended load of manipulation. Its purpose is to reduce the elastic damping of the SMT force through the compression of soft tissues and the movement of joints through the available range of motion. Some authors have suggested that preload force could be one of the variables changing with expertise. Cohen et al. observed higher preload values in a group of experienced chiropractors compared to a group of inexperienced students. Fazio et al. reported an increase in preload force after a specific training program that included feedback on preload force. No group differences were noted for preload values in our study. During our experiment, subjects were asked to perform ten spinal manipulations with the minimal force needed to release the electromagnet. The absence of a significant group difference for preload force in our study could be attributed to a lack of precise preload instructions given to subjects during the experiment. Future experiments investigating the impact of learning should include precise instructions regarding preload application.

Regarding the temporal characteristics of SMT, our data indicate that subjects with clinical experience demonstrated lower time to peak force values and higher rates of force production while performing thoracic spine manipulation. A significant group dif-
ference was also observed for time to peak force variability which doubled for inexperienced subjects.

Cohen et al found a similar difference in the rate of force production between newly-trained and experienced clinicians, but their results were not statistically significant. In another study where chiropractic students participated in a training program, Tram et al noted an increased rate of force production. They reported a decrease of the phase duration for only one force component (flexion) after training. These results do not allow us to clearly understand the effects of practice on the phase duration.

From a biomechanical point of view, applying the same amount of force while increasing the speed of the spinal manipulation will augment the stiffness of the targeted joint. Gal et al proposed that slower manipulations create greater relative movement within the functional spinal region than faster procedures. Even if more studies are warranted to understand the precise biomechanical effects of slower versus faster manipulative procedures, it can be assumed that with higher rates of force production less amplitude will be needed to manipulate a single segment.

The SMT in this experiment is a multi-joint movement that requires the subject to coordinate weight transfer to deliver a fast and precise force on a limited area of the spine. Overall, the results suggest that with regular clinical experience (practice) there is improvement in performance. One of the significant changes observed between inexperienced and experienced subjects relates to the timing of force application and is manifested by a significant decrease in time to peak force, unloading time and hand body delay. These changes are particularly interesting because they are related to the basic task requirements of SMT and clearly distinguish expertise level of the manipulators. This is also the case when learning sports skills in gymnastics or weight lifting where subjects improve timing and increase their consistency in performance outcome, that is, a decrease in within subject variability and refinement of performance or progressive inhibition of unwanted movements with expertise.

Similar results are reported for all types of throwing movements that require weight transfer. In fact, skillful throwing is recognized by an increase in the speed of object release velocity that is directly related to the timing of weight transfer in various experimental and natural settings. These novice and expert differences in timing suggest that it is an important variable when learning SMT. Further studies are needed to understand how the manipulative skills are acquired in inexperienced students.

CONCLUSIONS

This study demonstrates differences between groups of subjects with different levels of expertise in thoracic spine manipulation. The requirements of the task are complex, since subjects must learn to use large muscle groups in a precise and coordinated fashion to apply thrust in an effective manner. Distinctive features between experienced and inexperienced subjects are significant and revealing in identifying parameters of expertise. During their training years, chiropractic students learn to execute spinal manipulations faster, with less variability, and in a more coordinated fashion. This study also demonstrates the usefulness of a simple, instrumented manikin to analyze spinal manipulation and identify important parameters related to expertise.

Complete kinematic analysis could allow us to better understand the coordination principles implied in learning SMT and determine precisely the body segments involved in the movement preceding the thrust. Future studies should investigate the role of knowledge of results and knowledge of performance that could be important in developing pedagogical strategies to enhance the transfer of learning in chiropractic students.

REFERENCES

9. Scarratt GC, Chinn D, Ross B. The effects of augmented sensory feedback
WFC/ACC/CCIAP EDUCATION CONFERENCE: TRANSLATING EVIDENCE INTO PRACTICE

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60


APPENDIX A

Poster Presentation Abstracts

1. Joel Alcantara, **Evidence-Based Practice and Utilization Survey of Chiropractic Students** (*Life West – USA*)

2. David Byfield, (Mark Webster) **The Use of a Fully Integrated Learning Management System (METI Learning Space) for Teaching, Assessment and Feedback during Undergraduate Clinical Training: A Strategy Paper** (*University of Glamorgan – UK*)

3. Katie De Luca, **Emerging Researchers in Chiropractic: Their Attitudes, Ideas, and Aiding them towards Research** (*University of Newcastle – Australia*)

4. Ana Paula Facchinato, **Elaboration of a Series of Practical Handbook Guides about evaluation and Chiropractic Treatment of Musculoskeletal Conditions in Portuguese Language** (*University Anhembi Morumbi – Brazil*)

5. Ana Paula Facchinato, **The Objective Structured Clinical Examination Applied to last year Chiropractic Students before and after six months of Professional Practice** (*University Anhembi Morumbi – Brazil*)

6. Michael Hall (Anne Jensen), **The Role of Pulse Oximetry in Chiropractic Practice: A Rationale for its Use** (*Parker University – USA*)

7. Kim Khauv (Joel Alcantara), **The Khmer Translation and Cross-Cultural Adaptation of the Patient-Reported Outcome Measurement Information System (PROMIS) Global Health Survey** (*Life Chiropractic College West – USA*)

8. Kim Khauv (Joel Alcantara), **A Comparative Assessment of the Cultural Competency and Confidence to Serve Diverse Populations of Chiropractic Students in a Public Health Course: A Comparison of Two Cohorts** (*Life Chiropractic College West – USA*)

9. Tolu Oyelowo (Mike Wiles), **Assessing the Evolution of Biomedical Literacy in a Chiropractic Program** (*College of Chiropractic Northwest Health Services University – USA*)

10. Curtis Rigney, **The Effect a Portfolio Assessment had on the Utilization of Exercise Therapy in an Intern Clinic** (*Macquarie University – Australia*)

11. Ron Rupert, **Certainty of Knowledge Required for Evidence-Based Care** (*Parker University – USA*)
12. Stephney Whillier, *The Effect of Total Face-to-Face Teaching Hours, and Method of Delivery on Assessed Student Knowledge and Student Satisfaction in Two Units of Undergraduate Neuroanatomy* (*Macquarie University – Australia*)

13. Kenneth Young *The Legacy of the Radiology Residency of the Los Angeles College of Chiropractic since 1978: Creating Teacher, Leaders and Pioneers in the Profession* (*Murdoch University – Australia*)
1 Evidence-based Practice and Utilization Survey of Chiropractic Students

Introduction

Joel Alcantara

Life Chiropractic College West, USA

Chiropractic schools attempt to integrate evidence-based practice (EBP) into the training of chiropractors. These involve teaching the principles of EBP to chiropractic students through courses in introductory courses in research methods and epidemiology, during library-centric training and through Journal Clubs to list a few. Towards this end, it is fundamental to determine the evidence-based practice attitude of students. A greater understanding of the knowledge and attitudes of chiropractic students on EBP may facilitate their uptake and ultimately provide for a safer and more effective practice of chiropractic. Towards this end, we investigated the knowledge and attitudes of chiropractic students on EBP utilizing a modified version of the Evidence-Based practice Attitude and utilization SurvEy (EBASE) (1) for complementary and alternative practitioners.

Methods Design This study was approved by the Institutional Review Board of Life West College of Chiropractic, Hayward, CA, USA. EBASE is an 84-item, self-administered questionnaire constructed to measure the attitude, skill, training, knowledge, barriers, facilitators and utilization of EBP. The survey has been shown to be valid and reliable for its intended purpose (1). The survey instrument was modified for students and pilot tested with 20 chiropractic students with changes made (if any) as appropriate prior to implementing the study.

Results A convenience sample of 47 chiropractic students completed the survey. The majority of respondents were between the ages of 20-29 years of age (57%), more males (N=29) than females (N=18) and highly educated with a Bachelor's degree or higher (51%). With respect to the respondents' opinion of EBP, a high proportion agreed or strongly agreed that EBP was necessary in the practice of chiropractic (90%); that professional literature (i.e. journals and textbooks) and research findings will be useful in their day-to-day practice (79%); EBP improves the quality of patient care (64%); and evidence-based practice assists them in making decisions about patient care (79%). Over half (55%) disagreed or strongly disagreed that the adoption of EBP placed an unreasonable demand on their future practice with most (79%) interested in learning or improving the skills necessary to incorporate EBP into their practice. Most students considered themselves to have above-average skills in most areas of evidence-based practice such as locating professional literature (85%) and identifying answerable clinical questions (64%). However, the majority of chiropractors reported below-average or poor skill in conducting clinical trials (64%) and systematic reviews (53%).

In terms of EBP training/education in EBP-related areas, the majority of students indicated they had received either no training or minimal education (i.e. was only a
minor component of a course) for conducting clinical research (40%) and systematic reviews and meta-analyses (60%). In practicing EBP, the majority of respondents (57% and 51%, respectively) had read or reviewed 1-5 professional articles (i.e. professional journals & textbooks) and/or clinical research reports pertinent to their practice, in the preceding month. The majority of respondents (42%) had accessed free online search engines (e.g. CINAHL, MEDLINE) to search for practice related literature or content up to ten times in the preceding months.

Barriers to EBP uptake did not include lack of resources (i.e. access to a computer, the internet or online databases) (53%), insufficient skills for locating research (47%) or interpreting research (36%), lack of incentive to participate in EBP (43%), lack of interest in EBP (49%), lack of industry support for EBP (34%) and patient preference for treatment (51%). Factors determined to be a minor to moderate barrier to EBP participation were lack of relevance to CAM practice (55%), lack of colleague support for EBP (53%) lack of time and lack of clinical evidence (60%) and insufficient skills to critically appraise/evaluate the literature or apply research findings to clinical practice (68%). Most students reported the following activities to be “very useful” in assisting them to participate in evidence-based practice: access to the internet in the workplace (81%), access to free online databases in the workplace (e.g. Pubmed and Index to Chiropractic Literature) (81%), free access to online databases that usually require license fees (e.g. CINAHL and AMED) (70%), the ability to download full-text / full-length journal articles (70%), access to online education materials related to EBP (70%), access to critical reviews of research evidence relevant to the field (60%), access to rating tools (49%) and appraisal tools (51%).

Discussion Evidence-based medicine was defined by Sacket and colleagues (1) as the conscientious, explicit, and judicious integration of a clinician’s individual clinical expertise with the best available external evidence from systematic research and the more thoughtful identification and compassionate use of individual patients' predicaments, rights, and preferences in making clinical decisions about their care. Evidence-based practice (EBP) may be defined as the delivery of healthcare following the principles of EBM. With the continuing popularity of chiropractic and the challenge of all healthcare providers to provide safe and effective healthcare, chiropractors are not immune to such a challenge. The use of the EBASE survey to measure chiropractic students’ attitude, skill, training, knowledge, utilization, barriers to of evidence-based practice will inform the training of chiropractors towards and meet this challenge. Conclusion Chiropractic students embrace evidence-based practice. We encourage further research in this field.

References
2 The Use of a Fully Integrated Learning Management System (METI Learning Space) for Teaching, Assessment and Feedback during Undergraduate Training: A Strategy Paper

David Byfield

University of Glamorgan, UK

Introduction
METI Learning Space (MLS) is an innovative fully integrated learning management system for teaching, feedback, and assessment purposes. MLS is essentially an integrated system to support video capture, critical performance analysis, and feedback. MLS is a web-based learning environment for clinical skills education and primarily designed to connect simulation-based learning environment with the leading management and performance assessment tools for healthcare education. MLS integrates with simulators, skills trainers and Standardized Patient programs to help create, deliver, assess, evaluate and manage all aspects of healthcare learning. MLS has an easy to use web-based interface, which permits users to efficiently author cases, create varied question types, apply scoring methods, control scheduling and sessions. Notwithstanding, MLS has proven that it is a highly-adaptable, powerful, stable, and secure software solution for clinical educational purposes.

Clinical training at the WIOC complies with educational standards set down by both the General Chiropractic Council (GCC) and the European Council on Chiropractic Education (ECCE). The standards underpinning clinic training have moved away from measuring student clinical progress via a prescriptive number of new patients and treatment encounters moving towards an outcome based competency driven approach, which adheres to modern professional educational standards. This learning system provides an opportunity to employ a flexible approach to measuring student progression through the pre-clinical and clinical aspect of the programme and monitor the acquisition of various clinical and professional competencies providing essential feedback during the process.

The MLS system would allow us to initiate continuous assessment protocols in the outpatient clinic incorporating a robust feedback system for students to reflect and permit staff to formulate a remedial path for students engaged in the clinical training. Student experience in the clinical setting is important to solidify knowledge and apply patient management skills and the introduction of this technology should enhance this strategic direction.

In addition, the MLS system may be incorporated in the final OSCE/OSLER competency assessment procedures to ensure consistency and objectivity within the process. We currently employ a standard setting protocol for our clinical assessment, which builds in a degree of consistency between assessors; however this approach still presents a
challenge. MLS technology could be used for both clinic entrance and exit examinations to ensure consistency and student progression based upon the achievement of various clinical competencies. The system should also allow us to produce single event taping, with multiple cameras for student teaching and learning purposes. This will include scheduling multiple clinical activity streams for student assessment, recording and availability for formative feedback purposes.

There is also research potential that could be generated from incorporating a system with this type of application particularly in assessment validity and inter-tester reliability exercises. This system could also support educational research investigating student learning strategies and progression based on set learning outcomes and related competencies. This system is currently used extensively within medical schools in the United States and has been successfully incorporated into the Canadian Memorial Chiropractic College in Toronto, Canada as well as Palmer Chiropractic College and Texas Chiropractic College, which opens up information sharing and collaborative research potential.

At the WIOC, we are always exploring innovative ways to deliver the clinical training aspect of the degree. The clinical education has been hampered to some degree by the educational clinical training requirements which were primarily focused on patient treatment numbers. Achieving a set number of patient treatment encounters does not on its own provide enough confidence that students are safe and competent at the end of their course of study. We currently operate in a competency based outcomes programme, which permits a more flexible approach to clinical training. With this in mind, we need to incorporate flexible systems that allow us to objectively measure student progress and provide appropriate feedback in relation to the various competencies that we expect at the end of the programme.

Health professional education is moving in new directions and chiropractic educators need to review their clinical training procedures with a view of incorporating innovative methods to efficiently and cost effectively deliver high standard professional education. Chiropractic education can no longer remain isolated and the possibility of professional integration will be enhanced by establishing important intra and inter-professional links with other institutions and professional groups employing these learning platforms to enhance student experience and raise educational standards.
3 Emerging Researchers in Chiropractic: Their Attitudes, Ideas and aiding them Towards Research

Katie De Luca

University of Newcastle, Australia

BACKGROUND
Chiropractic is seen by some within the medical paradigm as lacking a strong evidence base, and may be an easy target for larger medical groups to criticise. However, in recent years, academics have published studies which promote the effectiveness of chiropractic and manual therapies(1-3). Academics and the two professional organizations of chiropractic in Australia understand the importance of developing a strong evidence base, and the role this evidence can play in informing health policy and informing the public. As a result, a variety of initiatives are being designed or are underway, to build research capacity in the field of chiropractic.

A key area in the progress of chiropractic research is the development and mentorship of higher degree research (HDR) students. Literature supports the undergraduate student experience in terms of educational environment(4-6), evidence based practice(7), patient communication and clinical skills.(8) One paper by Mrozek et al., in 2006 provides an update on the 1997 report on research in chiropractic education from the Research Agenda Conference in 1996. (9) This report discusses key research interest direction and collaboration, rather than the research student experience. Whilst most graduating chiropractic students opt for clinical practice, a small number of students venture into the HDR domain. Students must be supported with information based on funding availabilities, sound research methodologies and statistical skills and interpretation. Furthermore, supportive student networks to encourage and maintain motivation while they are engaged in HDR at the early career stage are likely to be important.

Developing an initiative to enhance the chiropractic HDR students is important to the future of chiropractic research. A survey aimed at identifying factors which are important to the current students, as well as identifying aspects which are currently lacking, should provide valuable information on the current state of the chiropractic HDR student research experience. We seek to translate this information into informative sessions to better develop their research skills. As a result, chiropractic HDR students may produce research which is of a higher standard and may be better accepted as evidence based practice. Furthermore, with a positive HDR experience, students may be more likely to pursue careers in chiropractic research and education and this will assist in building chiropractic research capacity at tertiary institutions. It may also have a snowball effect on encouraging other students into HDRs.
This research project is the first study to survey HDR chiropractic students. It is likely to provide an evidence base for HDR education by providing a greater understanding of the motivations, challenges and issues that surround career development in chiropractic research. The aims of this study are to identify the key characteristics of HDR students in chiropractic; identify the factors that motivate students to enter the field of chiropractic; identify the goals and aspirations of HDR chiropractic students; identify the challenges faced by HDR chiropractic students and the consequences for their career pathways; and identify factors that may impact on the retention of emerging researchers in the field of chiropractic.

METHODS
Population
A database will be compiled of a) HDR students whose primary focus is chiropractic; b) any registered chiropractor enrolled in HDR and c) any post doctoral early career researcher whose primary interest is chiropractic. HDR research is defined as enrolment in a Doctor of Philosophy or Masters by research. Inclusion criteria include current enrolment in 2012 and aged over 18. The sample will be gathered by contacting tertiary institutions and academics who enrol or supervise HDR students. In addition we will directly contact, chiropractic research foundations, postgraduate offices, leading researchers in chiropractic at Australian universities and personal correspondence with a view to locating eligible students and researchers. We will encourage snowball recruitment using those who respond promptly. The sample size will depend on the total number of eligible participants and the subset of that group who agree to take part.

Survey
A web-based questionnaire consisting of open and closed questions, with options to provide extra detail, will be developed.

The relative importance of a variety of factors that influenced participants’ interest and involvement in chiropractic research will be assessed. Other variables to be measured include contact with other researchers in chiropractic, support received, issues and challenges faced in pursuing a career, intentions to remain in the field and incentives to remain in the field. Demographic data on age, sex, birthplace, language spoken at home, financial support and details regarding discipline and topic will be collected.

Ethics
Ethics approval shall be sought from the Macquarie University Human Research Ethics Committee in 2012. An information sheet about the study will be provided and inclusion in the study must include providing informed consent.

Potential Outcomes
This research project is the first study to survey HDR chiropractic students. It will provide a greater understanding of the motivations, challenges and issues that surround career development in chiropractic research. It should assist in developing an initiative
to enhance the chiropractic HDR student research experience and may result in research which is of a higher standard and may be better accepted as evidence based practice. Furthermore, with a positive HDR experience, students may be more likely to pursue careers in chiropractic research and education and this will assist in building chiropractic research capacity at tertiary institutions.

Dissemination of Findings
The findings from this study will be disseminated at national and international conferences with the opportunity to collaborate with international chiropractic schools interested in building capacity and understanding the research experience of higher degree students.

The results from this study will be submitted to a peer-reviewed journal for publication. Ultimately, the findings from this study should help to develop a workshop for postgraduate chiropractic research students to encourage support networks.

References
4 Elaboration of a series of Practical Handbook Guides about evaluation and Chiropractic treatment of musculoskeletal conditions in Portuguese language

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Introduction: The higher education on Chiropractic in Brazil is recent, even as the professional activity. All the source of information regarding books, scientific articles and handbooks about chiropractic is in a foreign language, mainly in English, which shows the difficulty of easy access to the bibliographies in Portuguese, that is the Brazilian original language. By noticing this gap, and in order to approach the national reality, some students and professors envisioned the creation of a series of practical guides for assessment and treatment of diseases most prevalent in the clinical practice.

Objective: Develop a series of quick reference guides, updated and organized in a functional way, directed to students and health professionals, focused on the musculoskeletal area.

Methods: A preview review selected the most prevalent conditions and the orthopedic tests. The textbooks consulted were taken from real libraries, and the actualization of each theme was made by consulting the Scientific Electronic Library Online, Latin American and Caribbean Health Sciences, U.S. National Library of Medicine, Medline and Bibliomed. Information was obtained through literature reviews in sources of information related to Chiropractic, Orthopedics, Rheumatology and Physiotherapy, extracting the common denominators that would allow a systematization of the information. The quick reference guides were based methodologically and fundamentally in quick guides used in the medical area and presented in a handbook format. Since 2008, one volume was developed by a year.

Results: The titles were presented in a practical and didactic way in four volumes: Guide to Assessment and Treatment of Spinal Diseases. The first volume addresses the pathological conditions of the spine, the second refers to the upper limbs, and the third focuses the lower limbs. The conditions in the first three volumes were explained in topics, related to its diagnosis and treatment (synonymy, concept, risk factors, epidemiology, signs and symptoms, physical examination, orthopedic and neurological examination, imaging examination, laboratory tests, differential diagnosis, treatment and relevant observations). The fourth volume addressed the Orthopedic Tests, which were explained in topics related to its execution and clinical findings (synonymy, concept, test description, pathophysiological correlation, meaning of the test, correlated diseases, critical evaluation, determination of the score and relevant comments) supporting the systematization and uniformity of all the information.
Conclusion: A series of four practical handbook guides was developed in the Portuguese language, regarding the most common conditions and orthopedic tests related to the musculoskeletal area, promoting the construction of the diagnosis during the evaluation of the patient, assisting the examiner in your treatment plan.

Key words: Chiropractic, guide, spine, extremities, orthopedics tests.

REFERENCES
5 Title: The Objective Structured Clinical Examination applied to last year Chiropractic students before and after six months of professional practice.

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Introduction: The growth of the chiropractic profession in the world has raised important questions about health care, low public acceptance and legislative discrimination. These factors contribute to a growing concern about education, especially in the clinical training that needs to be constantly improved by training professionals to establish credibility for the profession. Specifically in Brazil, the chiropractic profession is still passing through the regulatory process, which requires further qualified professionals mainly for legislative reliability, the proper use of chiropractic practice, highlighting the need of a way of monitoring the profession, the professional practice, the education and the professional training. In order to ensure patient safety and qualified professional practice of chiropractic, there is a need for an independent system of evaluation and analysis for the gold standard of theoretical knowledge and practical skills of intern students in clinical uniquely by official examinations. The Undergraduate Chiropractic Program at University Anhembi Morumbi (UAM) lasts four and a half years (9 semesters), and has more than 5,000 hours, in which over than 1,000 hours are dedicated to the internship. Objective Structured Clinical Examination (OSCE), introduced by Hardin in 1979, is a practical method of assessment. It consists in a test of practical and cognitive skills of the students. Since 2004, the OSCE test is being applied in UAM to students enrolled in the last year (seventh semester) of the chiropractic program, before beginning the internship and after six months to check student’s progress. This test has undergone improvements and changes, with the goal of creating a prominent method of teaching-learning with minimal limitations. The purpose of this study is to evaluate the student’s performance before and after six months of clinical practice.

Methods: Students enrolled in the last year of the chiropractic course were included. They were divided in four groups, which were evaluated by the same test. The OSCE test was performed in the simulation laboratory at the second floor at the University Anhembi Morumbi, in eight different rooms. Each room had a large window, where each professor could watch from the outside and listen to the student by an earphone connected to microphone installed inside the room. One actor was trained in each station to be designated as a patient. Another person outside of the rooms was designate to control the time that should last 10 minutes for each station. A waiting room was also designed to the
students who were waiting for their time to start the test, and these students had no communication with anybody outside of this room.

Students, who had not done the test, should wait in the waiting room, until their group was called. The OSCE test was compound by eight stations, in which different clinical cases were presented, regarding the themes: Cervical Spine, Lumbar Spine, Thoracic Spine, Lower Extremities, Upper Extremities, Theoretical Question, Imaging questions and Vital Signs. The student should demonstrate in each station a brief and relevant anamnesis of the patient, perform the clinical examination and orthopedic tests related to the case, and define the diagnostic and the plan of treatment. Each group of students completed the circuit of 8 stations, and after all the students were evaluated, the evaluation coordinator collected the final scores of each student and calculated the final score by the average of the eight stations per student. Approval was needed for a minimum score equal or greater than 5.75. The approved students could start their internship at the University’s outpatient clinic. After six months, students who were approved in the first OSCE test and were enrolled in the outpatient clinic were selected to go through the same test. The second test scores were also collected and the results were compared, through observation of minimum and maximum values, the calculation of means, standard deviations and medians. To compare the average of two times (initial and final) T-Student paired test was used5, using a significance level of 5%.

**Results:** The 31 students enrolled in the last year (seventh semester) of the Chiropractic course were initially evaluated for the first OSCE test. The mean score of the overall stations was 6.7, the minimum average score was 3.1 and the maximum average score was 9.0. The higher average score was on the Vital Signs station (8.5) and the lower average score was on the Theoretical question (5.8). After six months, the students who had scores equal or superior to 5.75 were approved and evaluated again by a new OSCE test. Six students (19.4%) were not approved and were excluded for the second test. Therefore, to final comparison, data obtained from the 25 students who participated in both tests were used. On the second test, the mean score of the overall station was 6.95, the minimum average score was 4.86 and the maximum average score was 8.86. The higher average score on the second test was on the Vital Signs station (8.10) and the lower average score was on the Imaging question (4.52). There were no significant differences in the scores in the first to the second OSCE test in the overall average. However, there was a significant decrease from the first to the second OSCE test in the scores of two stations: Imaging questions and Vital Signs. The other stations showed no significant changes in the scores from the first to the second OSCE test.

**Conclusion:** The OSCE test is an important and valuable method of assessment of student’s knowledge. After six months of professional practice, there was no difference in student’s overall performance.
References
3- Diretrizes da OMS sobre formação básica e a segurança em quiropraxia. Organização Mundial da Saúde – Novo Hamburgo: Feevale, [2006].
6 The Role of Pulse Oximetry in Chiropractic Practice: A Rationale for its Use

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Introduction
Pulse oximetry is quickly becoming the standard measure of peripheral arterial oxygen saturation in health care venues such as critical care units [1], labor and delivery units [2], dentistry [3], and even veterinary medicine [4, 5]. Some consider it important enough to be the “fifth vital sign” [6-10].

A pulse oximeter is a simple, inexpensive and non-invasive method for quickly capturing a patient’s heart rate and oxygen saturation values. It is used to detect hypoxemia [1] by measuring the percentage of hemoglobin bound to oxygen in arterial blood, denoted as “SpO2” [1]. Hypoxemia often leads to hypoxia which results in oxidative stress, a condition associated with a wide variety of degenerative processes [11].

Chiropractors are trained to assess vital signs and the clinical signs of oxidative stress, such as cyanosis, pallor, fatigue, and mental confusion. However, previous studies have found that clinicians using these signs alone failed to detect hypoxemia/hypoxia in emergency room patients [6, 7]. Furthermore, it has been shown that the absence of these positive findings does not eliminate the possibility of serious cardiopulmonary or cerebrovascular disease [6, 7, 12]. Pulse oximetry may improve chiropractors’ ability to assess patients’ risk of potentially life-compromising illnesses. The purpose of this paper is to provide a rationale supporting the regular use of pulse oximetry in chiropractic practice.

Conceptual Model of Pulse Oximetry in a Chiropractic Setting
Currently, pulse oximetry is used regularly in acute care settings, and the authors believe there are strong arguments for its use within chiropractic clinical practice including these reasons:
1) Pulse oximetry allows for quick and reliable retrieval of oxygen saturation and heart rate, previously not as readily obtained;
2) Pulse oximetry allows for immediate assessment of potentially hypoxic patients; and
3) Pulse oximetry allows for important changes in patient management which may influence patient outcomes.

At present, chiropractors do not routinely employ any method to retrieve oxygen saturation, and therefore, may be missing critical information that may improve clinical decision-making. Conversely, many chiropractors regularly check heart rate and for the patency of peripheral arteries using palpation of peripheral pulses, which has been shown to be of questionable accuracy [13-16]. A more reliable assessment means is warranted.
Unquestionably, patients at risk for hypoxic conditions should be monitored using pulse oximetry [11, 17-22]. Hypoxia is commonly found in the elderly [23] and those at risk for coronary vascular disease [24], coronary artery disease [24], sleep disordered breathing [24], disorders of balance, hypertension [24], chronic migraines, and anxiety and mood disorders [24], all of which can be present within a population of chiropractic patients. See Figure 1 for a complete list of clinical signs and symptoms indicating use of pulse oximetry.

**Method of Utilization**

Pulse oximetry depends upon the optical characteristics of pulsating arterial blood [1]. The pulse oximeter has a pair of small light-emitting diodes (LEDs) which are placed on a translucent part of the patient’s body, such as an earlobe or fingertip [43]. One LED emits red light, the other, infrared light, which are absorbed at different rates by hemoglobin [1]. With each heart beat, the change in blood volume causes pulsating changes in the amounts of red and infrared light absorbed [1]. From this information, SpO2 can be calculated using an algorithm programmed into the device. Most pulse oximeters display both the SpO2 (in % saturation) and heart rate (in beats per minute).

Pulse oximetry norms have been established for SpO2, with values greater that 95% considered normal [1]. Also, for most devices accuracy to within 2% has become an acceptable standard, and most are considered sufficiently accurate and reliable for clinical purposes [11, 44-47].

**Interpreting Results**

Ideally, oxygen saturation values near 100% are preferred. However, daytime values which fall below 90% are cause for immediate attention [17-19, 49]. Since SpO2 values may drop 4-6% at night, daytime values of 90–95% may mean nighttime values below 90%, which is cause for concern [19, 49]. Chiropractors that detect daytime saturation values under 97% should monitor this patient’s SpO2 each visit, while values under 90% should prompt immediate referral for medical assessment. See Table 1 for a suggested action plan for interpreting results.

There is no evidence to date to suggest that chiropractic treatments can influence the outcome of pulse oximetry. However, no evidence does not mean that there is no benefit; it simply means there is no evidence to date. Research in this area is warranted.

**Limitations / Influencing Factors**

While pulse oximetry is a useful diagnostic tool, it does not offer a comprehensive description of the complete oxygen transport system. Pulse oximetry is one part of the thorough assessment of a patient’s oxygenation status, which should also include assessment of oxygen delivery and perfusion systems, and the patient’s ability to ventilate [43]. The oxygen-carrying capacity of blood may be hindered by certain disease states, such as anemia [58] or reduced or abnormal hemoglobin [1, 43]. Low perfusion states will also result in inaccurate SpO2 readings due to low signal of the pulsating flow of blood [1]. Therefore caution is recommended with conditions such as peripheral neuropathies [43] or

6-2
peripheral artery disease [59]. Error may also be introduced with tremor or excessive movement because of signal loss [1, 43]. Sensor malpositioning can also result in inaccuracies. False positive readings are common if the sensors detect excessive ambient light, such as from sunlight, fluorescent lights, infrared heating lights or examination lights [1]. Any discoloration of the nailbed or a dark nail polish may affect transmission of the light; however, darkly pigmented skin does not seem to impact SpO₂ [1, 43]. In addition, severe jaundice or hyperbilirubinemia might have an impact if SpO₂ is less than 90% [1]. The use of pulse oximetry may be misleading in patients whose ability to ventilate is compromised, such as those with chronic obstructive pulmonary disease [40, 60] or acute asthma [61, 62]. While it may be helpful to monitor an acute exacerbation of these conditions, additional assessment must also be undertaken [40, 60-62].

Summary
As primary health care providers, chiropractors should be vigilant in detecting any sign of oxidative stress or hypoxemia in their patients. Quantification of saturation values with heart rate may give clinical aid to the management of the chiropractic patient. When used appropriately, pulse oximetry offers chiropractors a safe and effective way to easily monitor patients’ oxygen saturation levels.

References


FIGURE 1 –
Critical signs and symptoms indicating use of pulse oximetry History

Inadequate external respiration
Decreased O2 in environment
High altitudes [25]
Enclosures without outside ventilation [26]
Smoke inhalation [26]
Toxic gas inhalation [26]
Inadequate mechanical ventilation
Pain [27, 28]
Emphysema [27]
Pleurisy [29]
Sleep disordered breathing (e.g. apnea) [30]
Traumatic injuries
Rib fractures [26, 27]
Pneumothorax [26]
Flail chest [31]
Crushing neck or chest injuries [26, 27]
Other conditions
Airway obstruction [32]
Anxiety [27, 33]
Depression [34]
Chronic migraines [35]
Chronic illness [36-38]
Inadequate oxygen diffusion
Pulmonary edema [26]
Pneumonia [39]
COPD [40]
Pulmonary emboli [26]
Inadequate oxygen transport
Anemia
Inadequate hemoglobin [41]
Inadequate # RBCs [41]
Poisoning
Carbon monoxide poisoning [26]
7 The Khmer Translation and Cross-Cultural Adaptation of the Patient-Reported Outcome Measurement Information System (PROMIS) Global Health Survey

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Objective
To report on the translation and cross-cultural adaptation into Khmer language of the Patient-Reported Outcome Measurement Information system (PROMIS) Global Health survey.

Introduction
According to the Yale Cambodian Genocide Program, the Khmer Rouge killed approximately 1.7 million people or 21% of the country’s population between the years 1975-79.(1) It is well documented by Hinton et al., that Cambodian refugees and survivors of the genocide suffered posttraumatic stress disorder (PTSD) and panic attacks.(2-9) Today, Cambodian nationals suffer high incidence and prevalence of HIV/AIDS among sex workers(10-11), Dengue(12-13), and malaria(14-15). Quality of life (QOL) studies in Cambodia have been limited to HIV/AIDS, caretakers, and living with disabilities.(16-19) A chiropractic mission trip to Cambodia will measure QOL changes pre and post care using the National Institutes of Health (NIH) PROMIS Global Health survey. The PROMIS instruments were developed, validated, and standardized during a five-year initiative.(20-22) PROMIS instruments have later demonstrated high reliability and validity.(23-25) Hays et al (26) specifically developed the PROMIS 10-item Global Health survey and demonstrated it to have internal reliability. The global health items include questions regarding self-rated health, quality of life, physical health, mental health, social health, physical function, fatigue, pain and emotional distress.(see table 1) As of today, the PROMIS instruments are only available in the English language. In order to evaluate global health changes in Cambodian people during a chiropractic mission trip to Cambodia, the instrument will need to be translated into the Khmer language and culturally adapted for the Cambodian population.

Methods
This study received IRB Exemption from Life Chiropractic College West. Dr Guillemin’s method (27) was utilized to translate the PROMIS global health instrument. The Guillemin process has been used in many translation and cross-cultural adaptation of health related questionnaires into a variety of different languages.(28-34) Dr Guillemin(27) describes the process in five stages: Initial translation; Synthesis of these translations; Back translation; Expert committee; and Test of the pre-final version. The principal investigator
collaborated with a research project manager (PM) living in Phnom Penh, Cambodia to manage the translation process in Cambodia. The PM translated the Study Information Sheet into Khmer and hired all the translators involved. The PM also played the role of Independent Mediator (IM) during the Synthesis stage. First, two Initial translators translated the global health instrument into Khmer within 7 days. The IM met with the two translators to synthesize the two translations into one translated instrument. During the Back Translation stage, two separate and independent back-translators, who haven’t seen the original English version, back-translated the Khmer synthesized instrument back into English. An expert committee of three separate persons held a meeting to assure the Khmer instrument obtains semantic, idiomatic, experiential and conceptual equivalence of the original English version. Lastly, the PM will test and retest the translated version with a group of 30 Cambodian nationals for one day (test) and on the next day (retest) for accuracy and equivalence. Everyone involved with the project were Cambodian nationals who were proficient in the English language and they all signed an IRB approved Study Information Sheet.

Significance
This will be the first Khmer translation of PROMIS global health survey. The translated survey will be used in future reliability and validity studies of the Khmer translated instrument in Cambodia.

Result
The Khmer translation and cultural adaptation of the PROMIS Global Health instrument was successful.

Conclusion
Reliability and validity of the instrument is underway.

References


A Comparative Assessment of the Cultural Competency and Confidence to Serve Diverse Populations of Chiropractic Students in a Public Health Course: A Comparison of Two Cohorts

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Introduction:
To decrease health disparity in the care of diverse populations, allopathic and non-allopathic providers will require cultural competency to better serve these populations. Cultural competence in health care has been defined as, “understanding the importance of social and cultural influences on patients’ health beliefs and behaviors; considering how these factors interact at multiple levels of the health care delivery system” (3). A Healthy People 2020’s objective is to have 100% of healthcare provider degree granting institutions to include cultural diversity education in their curriculum. (4) We report on the impact in knowledge and confidence to serve diverse populations following a six-hour cultural competency training in two cohorts of third year chiropractic students.

Method: IRB was approved by Life Chiropractic College West, Hayward, CA. As part of a chiropractic college curriculum in Public Health, third year chiropractic students are required to complete a 6-hour cultural diversity lecture and exercise adopted by one of the authors from a course offered in the UCLA Master of Public Health program (5).

The course content on cultural competency is comprised of three parts:
1. Lecture on concepts of culture, ethnicity, religion and socialization; the diversity of the US population, concepts of health and illness, and health traditions.


3. A series of classroom exercises that exposes the participant’s cultural "blindspots", biases, preconceptions and an examination of possible solutions to improve the participant's cultural competence.

The impact of the training will be assessed using a quasi-experimental, one-group design that involves the administration of pre-and post-training surveys. The surveys consist of two parts. The first was developed by the principal investigator and consisted of a 40-item
questionnaire to assess the knowledge gained by chiropractic students on cultural diversity as described above. The second survey is a 15-item questionnaire that rates the student’s perceived confidence to serve patients of diverse populations. The rating utilizes a 5-point Likert Scale to elicit their confidence levels (6). The confidence survey instrument was originally developed by Dr. Mitra Assemi, University of California at San Francisco, as a 12-item Cultural Competency confidence survey (6) to measure change in confidence by pharmacy students experienced after completion of an 8-hour cultural competency elective course. The instrument was later modified by Muzumdar et al. (7) at the University of Minnesota, with the addition of three more items for a total of 15-items. We were directed by Mazumdar et al. (7) to Dr. Mitra Assemi for permission. In an email from Dr. Mitra Assemi, PhD assemim@pharmacy.ucsf.edu on August 21, 2011, permission was provided to use the 15-item questionnaire for our purpose.

We utilized paired t-tests (IBM SPSS software v19; Chicago, IL) to determine changes in scores using a 40-item (to assess knowledge) and 15-item questionnaires (to rate their confidence) for our stated purpose. Additionally, information regarding demographic and cultural competency experience was collected in cohort 2 that was not collected in cohort 1.

**Results:**
Cohort 1 comprised 46 students (average age = 28.7 years; 23 males: 23 females). Analysis revealed statistically significant increase in knowledge scores (t-test=9.406; p=0.000) but not in their confidence (t-test=1.890; p=0.065) to serve diverse populations. Cohort 2 comprised 37 students (average age = 28.2 years; 24 males: 13 females). Unlike the first cohort, the knowledge (t-test=7.717; p=0.000) and confidence (t-test=2.728; p=0.010) scores increased from baseline measures. Gender trends in confidence were not observed. Additionally, the majority of Cohort 2 were United States citizens (n = 36; 85.7%) and White (n = 26; 61.9%) followed by Asian (n = 6; 14.3%), Hispanic (n = 3; 7.1%) and each of the Black/African American and American Indian/Alaskan Native groups represented by one person (2.4%). Over seventy percent of the students have not experienced previous cultural competency training (n = 27; 71.1%), did not have foreign work experience (n = 29; 76.3%) and have not served on a mission trip to a foreign country (n = 27; 71.1%) but have provided care to immigrant patients in the college health center (n = 28; 75.7%). Over half of the students (n = 21; 55.3%) have experienced difficulties communicating with immigrant patients.

**Discussion:**
Including cultural information about traditional health beliefs and how it impacts competency in healthcare delivery has been successfully integrated in many different health discipline’s curricula (8-12). Students attending medical, dental, nursing and pharmacy programs have cultural competency integrated within their educational experience to increase their cultural diversity awareness and improve their cultural
competency. The result was achieved high scores on virtues like compassion and wisdom (10), with students placing a high value and appreciation in their cultural competency courses to preparing them to provide care to diverse patient populations (12).

In this current study, the knowledge of chiropractic students increased significantly following a course in cultural competence. Their confidence to serve diverse populations, however, did not change significantly. Further examination of our data revealed that baseline measures on confidence may be relatively high when compared to students of other professions. After these results were shared with the students of cohort 2, the instructor of the course asked the students why they felt their baseline confidence scores were high as compared to pharmacy students of previous studies (6,7). The students shared perhaps third year chiropractic students gained higher confidence because they spend more clinical hours face-to-face patients than pharmacy students. Another hypothesis shared by the students was that chiropractic students entered their profession wanted to help others in need. These two hypotheses will have to be examined in future studies.

**Conclusion:**
Chiropractic students increase their knowledge in cultural competency but not their confidence to treat diverse populations following an educational intervention. Further study is required to determine explanatory variables with our findings.

**References:**
5. Taub B. CHS 210. Foundations of Community Health Sciences. University of California, Los Angeles; notes provided at lecture given in April 2005

Assessing the Evolution of Biomedical Literacy in a Chiropractic Program

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Chiropractic students are expected to be competent in their use of medical terminology at a level equivalent to that of a medical student soon after matriculation. It is unclear whether they grasp this as a result of participating in basic science classes or if a specific medical terminology course is needed.

The purpose of this paper is to discuss the results of a study to determine if medical terminology evolves as a consequence of participation in courses within a chiropractic program.

This was a prospective study designed to assess biomedical literacy evolution; using a terminology test. To test medical terminology knowledge a paper-based test was prepared and a University institutional review board (IRB) review of participant risk and benefit was conducted. Approval was obtained (IRB No: 113-72-06-09). Informed consent was obtained from eventual participants and scantron based assessments were provided.

There was no obligation for students to agree to complete the assessments, and no compensation was paid to those students who did participate. All tests were assigned a tracking number. The responses were entered electronically, using Scantron readers. The test was offered in a secured room and special consideration was given to avoid any disruption to student schedules. The pre- and post- test interval was twelve weeks.

Conclusion
Pre and post-tests on medical terminology were administered to first year chiropractic students during two of the three terms comprising the first year program. Results indicated that in general, medical literacy improved spontaneously over the term; specific areas of improvement were consistent with the content of the curriculum during this period of time. These results have implications for the curriculum in the chiropractic program.
10 The Effect a Portfolio Assessment had on the Utilization of Exercise Therapy in an Intern Clinic

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Introduction:
Rehabilitation is taught in many chiropractic institutions in many countries. In the past 20 years, this author has seen rehabilitation become a standard within chiropractic education and practice. Moreover, governments around the world have recommended the use of rehabilitation in the management of low back pain and other musculoskeletal conditions. It is expected that rehabilitation (aka, exercise therapy, active care, self-care) will play a role in management of patients with musculoskeletal conditions at one point or another. The author has been puzzled by what appears to be a lack of widespread implementation of active care modalities in patient management plans designed by student interns. A number of learning and teaching initiatives have been explored over the years in attempts to increase the use of rehabilitation. This paper is a descriptive pilot study that explores the impact a portfolio assessment tool had on students’ perceptions and attitudes about rehabilitation in chiropractic practice. Would an increase in confidence of clinical reasoning related to rehabilitation correlate with an increase in use of rehabilitation in clinic?

The portfolio assessment was a semester long assessment that was comprised of a number of “activities” related to each patient assessment protocol taught within the unit. The students were to complete these activities in their own time. The students were required to record a finding for each patient assessment as well as a detailed analysis and interpretation of the findings. Each component required self-directed learning and reflection. Students received feedback as to their level of understand and the quality of their work from their tutors during the semester. The assessment tool reached its conclusion with a one hour session where the students worked up a case which included a patient history and assessment which lead to a “functional diagnosis”.

Methods:
The hypothesis being explored was that with the self-directed study combined with guided expertise; as provided by the portfolio assessment, would enhance confidence in clinical reasoning, which could then translate into greater uptake of rehabilitation within patient management plans. A survey was designed and implemented to assess two different cohorts of students; a graduating class that did not experience the portfolio assessment and a graduating class that did. This project was approved by the Human Ethics Committee at the Macquarie University.
The survey had 23 items to which the participants were asked to respond. Five were related to demographics which could be related to particular attitudinal findings. Gender, age group,
and philosophy of chiropractic are examples of the demographic questions. Fifteen items were statements to which the participants were asked to express their level of agreement (i.e., strongly disagree to strongly agree, neutral and N/A were also options). Some examples of these statements include “I am able to offer active care modalities to my patients”, “I am uncertain as to how I should implement rehabilitation in practice”, and “I am interested in furthering my studies in rehabilitation after I graduate”. The last three items were opened ended questions that allowed the participants to respond in their own words. These questions were “what did you like most about the rehabilitation instruction at Macquarie University?”, “what are your recommendations for improving the rehabilitation program at Macquarie University?”, and “approximately to what percentage of patients do (did) you prescribe rehabilitation?”

Results and Discussion:
The response rate of the first cohort of graduates (without portfolio) was 14%. One year later, 24% of the second cohort (with portfolio) responded. Due to the brevity of this paper, the discussion will be focused on the fifteen statement items and their initial analyses. 8 out of the 15 items were related to the use of rehabilitation in practice. The other 7 items were related to their education and perception of rehabilitation. There was little difference between the cohorts in relation to the items that were related to rehabilitation in practice. For example, both groups agreed that rehabilitation was well supported at the Macquarie University. Both groups also agreed that rehabilitation was an important component in patient management. Most respondents did not want a “cookbook” approach to rehabilitation.

The items that demonstrated the greatest divergence were related to how the students’ felt about their education in rehabilitation and the result of that education. The students that experienced the portfolio assessment felt that the unit’s lecture style suited their learning style more so than the first group. The portfolio group also had greater agreement with the statement, “the management of rehabilitation tutorials enabled me to learn the rehabilitation procedures”. Item number 18 had the greatest degree of difference where the portfolio cohort had the greatest level of agreement. It reads, “the rehabilitation units encouraged me to think analytically”.

One of the most important items that measured the impact the portfolio assessment had was the last item; “approximately to what percentage of patients do (did) you prescribe rehabilitation?” The percentage estimated by the first cohort was 71%. The second cohort estimated 70%.

Based on these preliminary findings, it appears that the implementation of the portfolio did not increase the use of rehabilitation within the patient management plans designed by interns. However, the portfolio instrument appears to have improved the learners’ experience in the rehabilitation units. Moreover, being able to encourage future
chiropractors to think analytically is a significant outcome. The respondents offered good suggestions on how to improve rehabilitation instruction. Perhaps by following these suggestions, the use of rehabilitation by chiropractic interns will increase.

Conclusion:
The portfolio assessment is a good instrument to encourage active learning and enhance understanding. This study illustrates how it may be used to enhance the art of clinical reasoning.
11  Certainty of Knowledge Required for Evidence-Based Care

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The multiple choice exam has become the hallmark of chiropractic student assessment in part because a large portion of the education involves rote learning. Rote intensive subjects include facts related to anatomy, physiology, orthopedic tests, nutrition and to some extent virtually all courses. These facts provide the foundation and are integrated into higher order thinking and reasoning. Critical thinking and reasoning are required for the assessment of the scientific evidence and an understanding and commanding this evidence is one of the three primary components for evidence-based patient care. If the factual foundation of a student’s chiropractic education is incomplete or flawed, the ability to provide evidence-based care in college clinics or after graduation is compromised. Previous research demonstrates that there is inconsistency in applying diagnostic and treatment evidence in a chiropractic clinic. (1)

The Multiple Choice (MC) examination is the dominate assessment tool used in all chiropractic education; including undergraduate programs, continuing education certifications and standardized tests including the National Board of Chiropractic Examiners. (2) These tests play a major role in evaluating whether students have a satisfactory command of the information needed for evidence-based practice.

Fredrick J. Kelly, a professor from Kansas, is credited as the inventor of the multiple-choice question format. The development was spawned by the pressing need in 1914 to assess hundreds of thousands of immigrants for industrial jobs, the military and other needs to support the U.S. engagement in World War I. (3) To this day, nearly 100 years later, the multiple choice question is the dominate form of student assessment in the United States.

The strength of multiple choice assessments includes simplicity, convenience, ease of scoring and objectivity in grading. On the other hand there are many weaknesses associated with MC questions including the fact that they only assess the student’s rote learning at the lowest level of knowledge as reflected in Bloom’s Taxonomy. (4) Dr. Frederick Kelly stated it this way “This is a test of lower order thinking for the lower orders.”

Another problem associated with MC questions is the uncertainty regarding the student’s actual command of the material. The assumption is that if the student answered the questions correctly they were knowledgeable of the material. This belief may or may not be warranted. It is common for students to guess correctly but have virtually no command of the content. Sometimes the question that is answered correctly is simply a reflection of the weakness of the alternative MC answers.
Although there are varying opinions regarding which specific question formats are considered “multiple choice”, the most common form is a stated question followed by several possible answers. The student is required to identify the appropriate answer(s) to the question. In clinical practice the patient does not present the physician with multiple choice diagnosis and treatment options. It is really not enough that a student responds with the correct answer but they should understand with confidence why the answer was correct.

“The usual tests and the language habits of our culture tend to promote confusion between certainty and belief. They encourage both the vice of acting and speaking as though we are certain when we are only fairly sure...” (5)

In order to improve student assessment we have experimented with a certainty or confidence scale in conjunction with MC questions. The student (or faculty member) provides an answer to the MC question in the customary way but also indicates the relative confidence they have with each answer they make. A sample of a scale we have used in a chiropractic application appears in the example below.

| 1. The Dix-Hallpike maneuver can accurately diagnose 19% of all cases of: |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| A. Sacroiliac dysfunction | B. Otitis media | C. Patellofemoral pain syndrome | D. Dizziness |

1a. How certain are you about your answer above?

| Very certain | Certain | Undecided | Uncertain | Very uncertain |

The following strategy was recommended by Chanond (6) with respect to correct and incorrect answers with varying degrees of confidence in the response:
1. Correct with High Confidence: Simply advise the student that the answer was correct
2. Correct with Low Confidence: Advise that the answer is correct but add an explanation as to why it was correct
3. Incorrect with High Confidence: The correct answer should be identified along with an explanation of why it is correct. This should be followed by why the incorrect answer is incorrect.
4. Incorrect Response with Low Confidence: Provide correct answer and rationale of why the answer is correct.

A comprehensive literature search located no previous reference to the use of confidence scales in either chiropractic or medical education. The command of factual content is critical to evidence based patient care and confidence scales provide more complete feedback to educators. Reliance on the MC question format alone leaves open to question the true knowledge of the student and also promotes guessing by educators who make assumptions
based upon correct answers. The use of confidence scales and other tools found in the
higher education literature could potentially contribute much to our precision in assessing
student knowledge. It would also contribute significantly to fostering evidence based
education and improved patient care.

References
1. Kleinfield SL, Daniel D, Ndetan H. Faculty perception of clinical value of five commonly

3. Where Did Standardized Testing Come From Anyway? EXCERPT, from Chapter Four, "How
We Measure," in Cathy N. Davidson Now You See It: How the Brain Science of Attention Will
The classification of educational goals, by a committee of college and university examiners. 
6. Chanond K. The effects of feedback, correctness of response and response confidence on
learners’ retention in computer-assisted instruction. PhD dissertation, The University of
Texas at Austin, 1988.
12 The Effect of Total Face-to Face Teaching Hours, and method of Delivery on Assessed Student Knowledge and Student Satisfaction in Two Units of Undergraduate Neuroanatomy

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INTRODUCTION
The curriculum for anatomy at Macquarie University was restructured in 2010/2011, which resulted in both the old unit (HLTH308) and the new unit (HLTH214) of neuroanatomy being run simultaneously in second semester of 2011. The learning outcomes, course content, credit points and assessments were the same for the two neuroanatomy units. The new unit differed from the old in having an extra hour of lecture time per week (three hours versus the original two hours) and an additional hour of tutorial time per week. The material covered in the tutorial was extracted from the practical time, and included case studies and functional/living neuroanatomy. This left more time in the practical classes to study projections and models. Tutorials allowed for discussion and interaction around more difficult aspects of the curriculum.

Curricula in anatomy education should be revised and updated, but the decision to improve education should be reflected in outcomes such as student grades and student satisfaction. The objective of this study was to measure these outcomes, and therefore assess whether the increase in face-to-face teaching hours from four to six per week resulted in improved grades and levels of student satisfaction with the course.

METHODS
All 183 students that were enrolled in the two units consented to participate in this study, of which 159 completed the anonymous questionnaire. Informed written consent was obtained in week 2, and the questionnaire was administered in week 12 of the 13 week unit. The questionnaire included questions about: (1) basic demographic information; (2) self-reported estimates of average time of self-directed study undertaken per week; (3) self-rated level of knowledge and understanding on a scale from 0 to 100; and (4) a battery of questions designed to elucidate the students’ satisfaction with lectures, practical classes and, where applicable, tutorial classes. Students indicated their level of agreement of a series of statements using a standard 5-point Likert scale, and cumulative satisfaction scores were subsequently calculated. In addition, Standard Numerical Grades (SNGs), University Admission Index scores (UAIs) and grade-point averages (GPAs) for each participating student were retrieved directly from University records. All analyses were conducted after the final grades were officially released. Ethical approval to conduct this research was obtained from the Macquarie University Human Research Ethics Committee (Ref: 5201100130).
RESULTS
The two cohorts of students were not statistically different in regard to age (P=0.713), male to female ratio (P=0.643), ratio of international to domestic students (P=0.836), and ratio of English speaking to English as a Second Language students (P=0.230). The two cohorts spent the same number of minutes a week on self-study (P=0.175; CI: 13.6, 74.1). The two cohorts differed in their UAI (HLTH214:79±11; HLTH308:75±15; P=0.042; CI: 0.15, 7.85), GPAs (HLTH214:3.0±0.7; HLTH308:2.0±0.7; P<0.001; CI: 0.80, 1.20), and ratio of students with previous degrees versus no previous degree (HLTH214:HLTH308: 24:55::9:7; P=0.003). The HLTH214 cohort rated their own level of knowledge and understanding of the unit material significantly higher compared to the HLTH308 cohort (63.5±14.0 versus 58.1±1.4; P=0.006; CI: 1.5, 9.2). Despite this, the two cohorts did not differ in their final grades (HLTH214:62±16.4 versus HLTH308:61±15.0; P=0.667; CI: 3.6, 5.6), nor were the distributions of the final grades in the two cohorts significantly different. However, HLTH214 did report higher levels of satisfaction with all aspects of the course compared to the HLTH308 students (HLTH214:5.96±3.3 versus HLTH308:7.8±2.7; P<0.001; CI: 1.0, 2.7).

CONCLUSION
Increasing the face-to-face teaching from four to six hours a week, and the inclusion of tutorials as a teaching method, did not improve the average final grades, but did increase student satisfaction, and the sense students had of their own level of knowledge and understanding of the course.
13 The Legacy of the Radiology Residency of the Los Angeles College of Chiropractic since 1978: Creating Teacher, Leaders and Pioneers in the Profession

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Objective: In 2000 the authors published a study describing the employment statuses and contributions to the profession of the graduates of the Radiology Residency of the Los Angeles College of Chiropractic (LACC) since 1978, the year the Joseph W Howe, DC, DACBR arrived and revamped the residency. Ten years later it was decided that an update would be worthwhile, with data on the more recent graduates, additional information on the original graduates, and some analysis of the results.

Methods: Former residents’ career histories were traced through publicly available electronic documents such as web sites and social media. Proportional comparisons were made with non-residency-trained chiropractors.

Results: The graduates’ career paths have largely remained within chiropractic, in clinical and radiology private practice as well as in academia, but a few have stepped out of chiropractic. 28 of 45 former residents (62%) have been in education. 4 of 45 (9%) have moved internationally. 12 (27%) have attained a Chair of department position or higher.

Conclusion: A large proportion of former LACC radiology residents hold teaching and leadership positions, and there are indications that more of them hold these types of positions internationally, as compared to American-trained chiropractors without residency training. Although data for most of them were located, the study was limited by failure to gain information for all the former residents. Questions remain regarding higher degree attainment and motivation behind the career choices as well as whether these findings are true of other residencies.