Identifying factors likely to influence the use of diagnostic imaging guidelines for spine disorders among chiropractors’ in North America

Ottawa Hospital Research Institute
Population Health, University of Ottawa
Université du Québec à Trois-Rivières

André Bussières DC, FCCS (C), MSc, PhD (candidate)

KT Seminar Series
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KT CANADA.net
Background

• High prevalence of neck & back pain
  – Enormous social, psychological, economic burden
  – Most seeking help consult 1° care professionals

• Over 4 million Canadians visit 6000 chiropractors each year (x 10 in USA)
  • Statutory regulation across North Am, specialised in managing musculoskeletal disorders
  • As effective & safe as conventional MD care and physiotherapy
    (Coulter 2005, Bronfort 2008, 10, 12, NPTF 2008)
Despite available evidence for managing neck & back pain, wide variations in services provided by chiropractors (Shekelle 1995, Coulter 2002, 2005)


Spine x-rays unnecessary if no red flags
- Rarely reveal source of patient complaint
- Inefficient diagnosis can lead to inappropriate treatment
- Unnecessary ionizing radiation exposure
- Increase waiting time
- Added costs
Rationale

- CPGs useful where significant practice variations exist

- However, small-modest impact of guidelines
  (Grimshaw 2004, French 2010, CADTH Rx for Change 2012)

- Choice of dissemination/implementation strategies
  - Characteristics of individuals, settings, guidelines…
  - Barriers & enablers
  - Likely costs & benefits of strategies
    (Grol 2003, Wensing 2005)

- Explicit use of theories offers a way of addressing these issues
  (Eccles 2005, Graham 2007)
Objectives

1. To describe current practice patterns and variations in spine x-ray ordering

2. To evaluate the impact of web-based guidelines dissemination on use of spine x-rays

3. To identify beliefs about "managing back pain without x-rays" and to explore barriers/facilitators to guidelines implementation

4. To identify factors predictive of ordering lumbar spine x-rays
As part of Quality Improvement (QI) objectives aiming to promote selective use of spine x-rays

1. American Speciality Health Network (ASH)
   - Coverage in 50 states to 13 million members, including chiropractic services ~ 14,000 providers

2. Two Canadian provinces (Ontario, Quebec)
   - Diagnostic Imaging Guidelines for Adult Spine Disorders (DIGASD)
     - Initial release (2008); Websites (2009)
Diagnostic Imaging Practice Guidelines for Musculoskeletal Complaints in Adults—An Evidence-Based Approach—Part 3: Spinal Disorders

André E. Bussières, DC, John A.M. Taylor, DC, and Cynthia Peterson, DC, RN, MMEd

Abstract

Purpose: To develop evidence-based diagnostic imaging practice guidelines to assist chiropractors and other primary care providers in decision making for the appropriate use of diagnostic imaging for spinal disorders.

Methods: A comprehensive search of the English and French language literature was conducted using a combination of subject headings and keywords. The quality of the citations was assessed using the Quality of diagnostic accuracy studies (QUADAS), the Appraisal of Guidelines Research and Evaluation (AGREE), and the Stroke Prevention and Educational Awareness Diffusion (SPREAD) evaluation tools. The Referral Guidelines for Imaging (radiation protection 118) coordinated by the European Commission served as the initial template. The first draft was sent for an external review. A Delphi panel composed of international experts on the topic of musculoskeletal disorders in chiropractic radiology, clinical sciences, and research were invited to review and propose recommendations on the indications for diagnostic imaging. The guidelines were pilot tested and peer reviewed by practicing chiropractors, and by chiropractic and medical specialists. Recommendations were graded according to the strength of the evidence.

Results: Recommendations for diagnostic imaging guidelines of adult spine disorders are provided, supported by more than 385 primary and secondary citations. The overall quality of available literature is low, however. On average, 45 Delphi panelists completed 1 of 2 rounds, reaching more than 85% agreement on all 55 recommendations. Peer review by specialists reflected high levels of agreement, perceived ease of use of guidelines, and implementation feasibility. Dissemination and implementation strategies are discussed.

Conclusions: The guidelines are intended to be used in conjunction with sound clinical judgment and experience and should be updated regularly. Future research is needed to validate their content. (J Manipulative Physiol Ther)
Practice patterns and variations in spine x-ray ordering among chiropractors enlisted with a provider networks in the US

André Bussières DC, FCCS (C), MSc, PhD (candidate)
Jeremy M Grimshaw, MBChB, PhD, FRCGP
Timothy Ramsay, MSc, PhD
Anne Sales RN, PhD
Steven Hilles DC, MBA
Objectives

1. to describe baseline rates and variations of spine x-ray over a 12 month period

2. to identify provider, practice, and patient characteristics that may explain high spine x-ray ordering rate
Methods

• Design: cross-sectional analysis

• Data sources
  - Administrative claims (Jan-Dec, 2010)
  - Database linkage:
    1. Survey data with demographic/enrolment data
    2. Claims data for spine x-rays and patients characteristics aggregated at the provider level

• Contracted providers with ≥ 1 claim paid
• Consecutive adult with neck and back pain
• Sensitivity analysis: Onsite imaging services
Methods (2)

• Descriptive analysis
  ➢ baseline rates and variations of spine x-rays

• Negative binomial regression for count data with over-dispersion to identify predictors of high x-ray utilization for two outcomes:
  1. claims paid per patients
  2. claims paid within 5 days of initial visit per new patient exams

Data grouped by census regions for comparison
Results

- Complete data available for 6,946 providers and 249,193 adult patients (90,652 new patient exams)

- Outcomes: ordering rates (sd)
  1. 125 (291) spine x-rays / 1000 patients
  2. 204 (422) spine x-rays within 5 days of initial patient visit / 1000 new patient exams

- Sensitive analysis: similar predictors
Table 1. Regional variation in x-ray ordering rate (mean, SD) by State for the year 2010

<table>
<thead>
<tr>
<th>States (˃ 100 providers)</th>
<th>Providers (N)</th>
<th>Rate of x-rays within 5 days of new visit/New patient exam (mean, SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>6946</td>
<td>0.20 (0.42)</td>
</tr>
<tr>
<td>Arizona</td>
<td>260</td>
<td>0.21 (0.37)</td>
</tr>
<tr>
<td>California</td>
<td>2392</td>
<td>0.16 (0.29)</td>
</tr>
<tr>
<td>Connecticut</td>
<td>120</td>
<td>0.20 (0.46)</td>
</tr>
<tr>
<td>Georgia</td>
<td>468</td>
<td><strong>0.47 (0.56)</strong></td>
</tr>
<tr>
<td>New Jersey</td>
<td>436</td>
<td>0.24 (0.48)</td>
</tr>
<tr>
<td>New York</td>
<td>643</td>
<td>0.15 (0.37)</td>
</tr>
<tr>
<td>Ohio</td>
<td>214</td>
<td><strong>0.41 (0.70)</strong></td>
</tr>
<tr>
<td>Oregon</td>
<td>340</td>
<td>0.10 (0.25)</td>
</tr>
</tbody>
</table>
Table 2. Summary findings: Negative Binomial regression

<table>
<thead>
<tr>
<th>Predictor</th>
<th>df</th>
<th>IRR</th>
<th>Z</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Census region</td>
<td>3</td>
<td>0.94 (0.89-0.98)</td>
<td>-2.63</td>
<td>0.009</td>
</tr>
<tr>
<td>Chiro school attended</td>
<td>19</td>
<td>1.71 (1.52-1.92)</td>
<td>8.96</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Practice setting (U-S-Rural)</td>
<td>2</td>
<td>0.96 (0.89-0.99)</td>
<td>-1.04</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Practice type (solo, gr, empl)</td>
<td>2</td>
<td>1.41 (1.28-1.56)</td>
<td>6.86</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Gender (provider)</td>
<td>1</td>
<td>1.45 (1.25-1.69)</td>
<td>4.86</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Office type (free stand-building)</td>
<td>1</td>
<td>0.84 (0.75-0.94)</td>
<td>-2.98</td>
<td>0.055</td>
</tr>
<tr>
<td>Years in practice</td>
<td>3</td>
<td>1.11 (1.04-1.19)</td>
<td>3.34</td>
<td>0.001</td>
</tr>
<tr>
<td>Professional employment</td>
<td>1</td>
<td>0.74 (0.64-0.86)</td>
<td>-3.79</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>
Table 3. IRR and 95% CI for spine x-rays within 5 days of initial visit/new patient exams for the year 2010

<table>
<thead>
<tr>
<th>Predictors (N=6924)</th>
<th>Spine x-rays 5 days of initial patient visit per new patient exams</th>
<th>df</th>
<th>IRR</th>
<th>Z</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Census region</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td></td>
<td>1.09 (0.89-1.33)</td>
<td>0.68</td>
<td>0.411</td>
<td></td>
</tr>
<tr>
<td>Midwest</td>
<td></td>
<td>2.21 (1.56-3.19)</td>
<td>18.89</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>South</td>
<td></td>
<td>1.89 (1.51-2.39)</td>
<td>29.31</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>West (reference)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School attended</td>
<td></td>
<td>19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life</td>
<td></td>
<td>2.44 (1.78-3.33)</td>
<td>31.02</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>Sherman</td>
<td></td>
<td>2.43 (1.54-3.89)</td>
<td>14.18</td>
<td>0.0002</td>
<td></td>
</tr>
<tr>
<td>Parker</td>
<td></td>
<td>2.08 (1.35-1.88)</td>
<td>10.81</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Palmer (PCC)</td>
<td></td>
<td>2.29 (1.72-3.05)</td>
<td>32.75</td>
<td>&lt;.0001</td>
<td></td>
</tr>
</tbody>
</table>
Discussion

- Large regional variation persists. However, x-ray ordering lower than previously reported

Limitations

1. Confounding covariates (co-morbidity and reimbursement scheme) not available
2. Appropriateness not addressed: no detailed clinical information (red flags, diagnosis, disease severity...)
3. Self-reported data from survey
4. Could not collect test ordering for referred patients
5. Unclear if MRIs were being substituted for x-rays
Conclusion

• Despite available clinical practice guidelines, wide variations persists among ASH providers

• Such practice pattern suggests a change in the perceived need for x-rays

➢ Individual explanatory causes investigated using focus groups and predictive survey
Impact of guideline dissemination strategies among Network chiropractors:
Interrupted time series with segmented regression analysis

André Bussières DC, FCCS (C), MSc, PhD (candidate)
Jeremy M Grimshaw, MBChB, PhD, FRCGP
Timothy Ramsay, MSc, PhD
Anne Sales RN, PhD
Steven Hilles DC, MBA
Study 2

Objective

- To evaluate the impact of web-based guideline dissemination in reducing use of spine x-rays
Methods

• Design: Quasi-experimental using segmented regression analysis of interrupted time series (ITS)

• Setting/pop: ASH contracted chiropractors

• Intervention: Open access CPG (DIGASD, April 08)

• Data sources: Administrative claims (Jan 06-Dec 10)
  ➢ Consecutive adult spine disorders
Primary outcome

• A change in the **level** of the mean number of spine x-rays/1000 new patient exams per month immediately after the introduction of the guidelines and any pre and post-intervention **trends** difference.
Methods (2)

Data analysis and management

- No evidence of autocorrelation (\(dw=1.95, p=0.99\))
- Conservative approach (autoregressive errors)
  \[ Y_t = \beta_0 + (\beta_1 \times \text{Time}_t) + (\beta_2 \times \text{Intervention}_t) + (\beta_3 \times \text{Time}_t \text{ after } \text{Intervention}_t) + v_t \]  (error term)
- Sensitivity analysis to account for historical events
  - Two QI (educational strategies) targeting high x-ray users
<table>
<thead>
<tr>
<th>Guidelines dissemination</th>
<th>Coeff</th>
<th>95% CI</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Full model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ( B_0 )</td>
<td>0.2645</td>
<td>(0.2586, 0.2701)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Baseline trend ( B_1 )</td>
<td>-0.0011</td>
<td>(-0.0015, -0.0008)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Level change after guidelines release ( B_2 )</td>
<td>-0.0104</td>
<td>(-0.0182, -0.0026)</td>
<td>0.0114</td>
</tr>
<tr>
<td>Trend change after guidelines release ( B_3 )</td>
<td>-0.00004</td>
<td>(-0.0005, 0.0004)</td>
<td>0.8536</td>
</tr>
<tr>
<td>b. Parsimonious model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept ( B_0 )</td>
<td>0.2649</td>
<td>(0.2606, 0.2692)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Baseline trend ( B_1 )</td>
<td>-0.0012</td>
<td>(-0.0014, -0.0009)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td><strong>Level change</strong> after guidelines release ( B_2 )</td>
<td><strong>-0.0103</strong></td>
<td><strong>(-0.0179, -0.0026)</strong></td>
<td><strong>0.0109</strong></td>
</tr>
</tbody>
</table>
Monthly use of spine x-ray across ASH network before and after guidelines dissemination, controlling for ASH policy change.
Monthly use of spine x-ray in Georgia before and after guidelines dissemination controlling for two QI strategies
Results

• Utilization rate decreased steadily over five years
• Significant level change: -0.01; CI=-0.01,-0.002; \( p=0.01 \)
  No change in slopes
• 5.26% relative decrease (10/1000 absolute change) after dissemination of the guidelines
• Controlling for two educational strategies did not change the results
Discussion

• First study to document with a robust methodology a decrease in use of spine x-rays after dissemination of printed educational material (PME) among allied health providers enlisted in a PN

• Small-modest improvements (Giguère 12, Farmer 08, Grimshaw 04)

Limitations

1. Determinants of health care utilization (patient health status, extent of health coverage) not available

2. Threat to ITS unlikely: History, change in the composition of the study population, seasonality or testing effect
Conclusion

• This web-based dissemination strategy potentially had a significant population health and economic impact across the network.

• Further research needed to find more efficient guideline dissemination strategies.

  ➢ Should aim to identify barriers to change and target high users.
Factors likely to influence guideline compliance for spine disorders among chiropractors in North America: *Focus group study using the TDF*

André Bussières DC, FCCS (C), MSc, PhD (candidate)
Andrea M Patey, MSc
Jill J Francis, PhD, C.Psychol,
Anne E Sales RN PhD
Jeremy M Grimshaw, MBChB, PhD, FRCGP
*For the Canada PRIme Plus Team*
Psychology theories

- Few high quality theory-based interventions in health care (Graham 07)
- Theories can provide a framework
  - for interpreting and predicting behaviour
  - help tailor interventions to improve the likelihood of successful change
  - help evaluate potential causal mechanisms (Eccles 05, Graham 07)
- One study has applied theories to evidence-based chiropractic practice for managing acute low back pain (McKenzie, ALIGN Trial 10)
- No such studies among North American chiropractors
Theories to explain professionals’ behaviour

• Numerous theories, share overlapping constructs, unsure which is more relevant to particular context

• **Theoretical Domain Framework (TDF)**
  - Conceptual mapping of 128 explanatory constructs drawn from the 33 psychology theories (Michie 2005)
  - 12 domains to investigate determinants of specific clinical behaviour and inform designs of interventions
  - Interview guide based upon the TDF
    - 43 Qs + probes; assessed for face & content validity
<table>
<thead>
<tr>
<th></th>
<th>TDF domains</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Knowledge</td>
</tr>
<tr>
<td>2.</td>
<td>Skills</td>
</tr>
<tr>
<td>3.</td>
<td>Social/professional role and identity</td>
</tr>
<tr>
<td>4.</td>
<td>Belief about capability</td>
</tr>
<tr>
<td>5.</td>
<td>Beliefs about consequences</td>
</tr>
<tr>
<td>6.</td>
<td>Motivation and goals</td>
</tr>
<tr>
<td>7.</td>
<td>Memory, attention and decision process</td>
</tr>
<tr>
<td>8.</td>
<td>Environmental context and resources</td>
</tr>
<tr>
<td>9.</td>
<td>Social influence</td>
</tr>
<tr>
<td>10.</td>
<td>Emotion</td>
</tr>
<tr>
<td>11.</td>
<td>Behavioural regulation</td>
</tr>
<tr>
<td>12.</td>
<td>Nature of the behaviour</td>
</tr>
</tbody>
</table>
Objectives

• To identify chiropractors’ beliefs about "managing back pain without x-rays" and to explore barriers/facilitators to implementing guideline recommendations

Secondary objective

• To compare US and Canadian chiropractors on their beliefs regarding the use of spine x-rays
Methods

Six focus groups based on the TDF

- Useful when group norms and cultural values are of interest, and to explore the degree of consensus

- Purposive sample of ~16-24 chiropractors (USA & Canada) to seek respondents across a spectrum

- Over 150 practitioners invited between Feb-July 2010
- 21 chiropractors: San Diego, Atlanta, Ottawa, Trois-Rivières
- 60-90 minutes interviews digitally recorded, transcribed verbatim, and subjected to content analysis
Steps to operationalize the TDF (Francis 2009)

1. Code Interview
2. Identify Relevant Domains
3. Identify Specific Beliefs
4. Grouping of beliefs (increase/decrease/no influence)
5. Overarching themes
6. Identify key domains

- Transcripts coded independently by 2 assessors and differences resolved by consensus
- Validated by a health psychologist

KEY DOMAINS?
1) Frequency of specific beliefs
2) Presence of conflicting beliefs
3) Evidence of strong beliefs that may impact the behaviour

Provides detail about the role of the domain in influencing the behaviour
Intended to convey a meaning common to multiple statements

Select Theories or design an intervention
<table>
<thead>
<tr>
<th>TDF Domain</th>
<th>Response</th>
<th>Reduce</th>
<th>Increase</th>
<th>Belief</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beliefs about Consequences</td>
<td>334</td>
<td>28%</td>
<td>63%</td>
<td>15</td>
<td>Missing pathologies, litigation, adverse treatment effects</td>
</tr>
<tr>
<td>Social/Professional Role &amp; Identity</td>
<td>133</td>
<td>29%</td>
<td>50%</td>
<td>12</td>
<td>Professional Role; Norms; Agreement</td>
</tr>
<tr>
<td>Social Influences</td>
<td>128</td>
<td>29%</td>
<td>48%</td>
<td>6</td>
<td>Formal training, colleagues and patients</td>
</tr>
<tr>
<td>Beliefs about Capabilities</td>
<td>106</td>
<td>70%</td>
<td>31%</td>
<td>5</td>
<td>Levels of confidence and comfort</td>
</tr>
<tr>
<td>Knowledge</td>
<td>86</td>
<td>45%</td>
<td>38%</td>
<td>6</td>
<td>Guideline awareness and agreements</td>
</tr>
</tbody>
</table>
Beliefs about Consequences

Missing pathologies, risk of litigation or adverse reactions

**Beliefs likely to increase x-ray ordering**

"The problem is that we perform a service that could injure someone and we certainly want to know what we are dealing with before we start." (G1)

"What about exposure to liability? If you don’t have an x-ray where you missed a diagnosis." (C1)

**Beliefs likely to decrease x-ray ordering**

"Benefits to not using x-rays are cost savings and minimizing patient radiation exposure." (C1)
Social/ Professional role & Identity

Perceived autonomy, professional credibility, lack of standardization

Beliefs likely to increase x-ray ordering

"I want to be able to make my own decision that’s why I got into chiropractic." (G2)

"As a profession we take a lot of criticism... Some would say you’re not real doctors, you don’t take x-rays." (G2)

Beliefs likely to decrease x-ray ordering

"If we reduced x-ray utilisation rate, we could present ourselves to other professions and to the world as being efficient, doing the right thing for the right reason." (G2)
Differences between US & Canadian participants

1. X-ray utilisation rate (*Nature of the behaviour*)
   - Canada: 50-90%
   - California: < 10%
   - Atlanta: 20-50% (except 1 participant)

2. Perceived threat of litigation (*Beliefs about consequences*)

3. ASH incentives to conform with evidence-based practice (*Social influence, Social/ prof role and identity*)
   - Two factors known to influence guideline adoption and use of imaging studies

Limitations

1. Small sample; recruitment bias? *(volunteering to voice strong beliefs either in favour or against CPGs)*

2. Targeted care providers only

3. Theoretical constructs lack proper definition & many overlap between domains

4. Consensus difficult at times, in particular for ‘Beliefs about consequences’ and ‘Motivations and goals’
Study strength

1. Few studies examined potential barriers / facilitators to implementing CPGs in chiropractic using the TDF

2. Provides new insight into beliefs of chiropractors with respect to managing back pain without x-rays, and theory-based factors likely to influence compliance

Future directions

• Results informed of the development of a theory-based survey to identify potential predictors of behavioural change
Identifying factors influencing Ontario chiropractors use of spine x-rays:
A predictive study

André Bussières DC, FCCS (C), MSc, PhD (candidate)
Andrea M Patey, MSc
Jeremy M Grimshaw, MBChB, PhD, FRCGP
Jill J Francis, PhD, C.Psychol,
MP Gagnon PhD
Anne E Sales RN, PhD
Martin Eccles MD, FMedSci, FRCP, FRCGP, PhD
Godin Gaston, PhD
Louise Lemyre MA, PhD - For the Canada PRIme Plus Team
Objective

- To test the predictive power of theoretical constructs drawn from various theories

  - Responses should help identify modifiable variables that can predict targeted behaviours
  - These variables may be prime targets for interventions
Methods

• Design: Theory-based single postal questionnaire
• Random sample of 1000 Ontario chiropractors

• Outcomes
  ➢ Behavioural intention
  ➢ Behavioural simulation (5 case scenarios)

• Explanatory variables
  ➢ motivational theories (TPB, TIB), action theories (OLT and Planning), moral norm and models of habit

• Linear regression analysis to examine predictive value of each theoretical model individually
Theory of Planned Behaviour

- Behavioural beliefs x Outcome expectation → Attitude
- Normative beliefs x Motivation to comply → Subjective Norm → Intention → Behaviour
- Perceived control beliefs x Perceived power to Facilitate/inhibit → Perceived Behavioural Control (Ajzen 1975, 1991)
Examples of predictive measures to investigating beliefs associated with the behaviour of interest

• Attitude
  ➢ D: ‘Managing patients… would be (not at all beneficial/very beneficial)’

  ➢ I: Managing patients… would increase the risk of missing an underlying pathology (bb: very unlikely/very likely) \( \times \) Missing an underlying pathology (oe: un/important)

• Seven-point scale: 'Strongly Disagree' to 'Strongly Agree'
Adapted from Triandis’ Theory of Interpersonal Behaviour
(From Gagnon et al. 2006 with permission)

- **Facilitating conditions**
- **Behaviours**
- **Outcome evalu**
- **Perceived consequence**
- **Emotions**
- **Affect**

**Intention**

- **Personal Normative Beliefs**
  - Personal norms
  - Self-identity
  - Professional norms

- **Social Normative Beliefs**
  - Roles
  - Norms

- **Behav beliefs**

- **Frequency of past behaviours**

- **Facilitating conditions**

- **Behaviour**

- **Habit**
<table>
<thead>
<tr>
<th>Theory of Planned Behavior</th>
<th>Behavioural simulation</th>
<th>Behavioural intention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Beta</strong></td>
<td><strong>R^2 (adj)</strong></td>
</tr>
<tr>
<td>Intention</td>
<td>-0.655***</td>
<td></td>
</tr>
<tr>
<td>PBC direct</td>
<td>-0.012</td>
<td></td>
</tr>
<tr>
<td>PBC indirect</td>
<td>-0.186***</td>
<td><strong>0.593</strong></td>
</tr>
<tr>
<td>Attitude direct</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude indirect</td>
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<td>PBC direct</td>
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<td>PBC indirect</td>
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*p ≤ 0.05; **p ≤ 0.01; ***p ≤ 0.001
<table>
<thead>
<tr>
<th>Theory of Interpers. Behavior</th>
<th>Predictive Constructs</th>
<th>Behavioural Simulation</th>
<th>Behavioural Intention</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Beta</td>
<td>R^2 (adj)</td>
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<tr>
<td>Intention</td>
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<td><strong>Operant Learning Theory</strong></td>
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<td>Self-Reported Past Behav.</td>
<td>-0.223***</td>
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<td>0.167**</td>
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<td>Evidence of habit</td>
<td>-0.387***</td>
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<td>0.488***</td>
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<tr>
<td>Anticipated Consequences</td>
<td>-0.193**</td>
<td>**</td>
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<td>42.1*</td>
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<td>162.5*</td>
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Results

- 35% returned rate

- **Intention** best explained by TIB and TPB
  - Theory level variance: TPB 82%, TIB 83%, OLT 61.8%, and Habit 43%

- **Behavioural simulation** best explained by TPB, TIB and OLT
  - Theory level variance: TPB 59.3%, TIB 56.7%, OLT 54.4%, action planning 28.1%, personal moral norm 49.1% and Habit 27.1%
Discussion

• 39.9% said they would order an x-ray when not needed. Suggests persistent knowledge–practice gap
  ➢ Earlier surveys of Ontario chiropractors ~ 60%
    (Ammendolia 04, Aker 97)

• Models explained up to 59% of the variation in behavioural simulation and 83% in intention
  ➢ Scores for behaviour < behaviour simulation < intention
  ➢ $R^2$ varied from 0.001 to 0.58 for behaviour and 0.14 to 0.91 for intention (Godin 08)
  ➢ $R^2$ varied from 0.11 to 0.31 for simulation (Bonetti 10, Grimshaw 11, Eccles 07)
Limitations

- Response rate (35%), typical among care providers
- High $R^2$ scores?
  1. Possible response bias - need to compare demographics with available data
  2. Better formulated survey questions?
     - Informed in part by previous questionnaires
  3. A different professional group? (Godin 2005)
Conclusion

- Psychological models can be useful to understand and predict clinical behavior among chiropractors

- Provides an empirically-supported, theoretical basis for the design of quality improvement strategies to favour adoption of evidence-based practice by targeting relevant predictive factors

  ➢ Best applied to factors affecting post-intention: PBC indirect, Habit, Anticipated consequence, Action Planning
Future directions

• Little KT research in chiropractic

• Slow adoption of evidence-based principles
  ➢ differences in training and practice?

• Unsure if can infer from studies with physicians

• Need more KT research in chiropractic before we can generalize findings
  ➢ Only one (ongoing) cluster trial in Australia
  ➢ Findings may not generalize to Provider Network setting
Hypothesized theoretical framework for the study of healthcare professionals’ behaviour and intention

Beliefs about consequences → Belief about capability → Intention → Behaviour

Social influences → Intention

Moral norms → Intention

Professional Role & identity → Intention

Characteristics of Care professionals

Habit / past behaviour

(Godin 2008)
• To design and test an intervention to change professional behaviour based upon theoretical models, empirical data and evidence-based behaviour change techniques for chiropractors found to have a high baseline x-ray utilisation rate
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All co-authors

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