ARTICLE

Evaluating Physical Therapy Students' Knowledge of and Adherence to the Ambassador Low Back Pain Guideline

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ABSTRACT

Purpose: To examine a process for evaluating physiotherapy (PT) students' knowledge of and adherence to the Ambassador Low Back Pain (LBP) guideline using vignettes. ***Methods:*** The study used a cross-sectional survey design. Participants were PT students who had received information related to the guideline as part of their curriculum. Primary measures were responses to questions about the management of four clinical vignettes. Adherence to guideline recommendations was measured by comparing participant scores to a "guideline-based" set of responses from a physiotherapist involved in developing the Ambassador guideline, which was considered a criterion standard. ***Results:*** A total of 74 respondents provided complete data, for a response rate of 89%; 65 (88%) reported no knowledge of the guideline. Overall consistency with the criterion standard was high (>70%). Respondents demonstrated high adherence when identifying red flags and deciding whether to refer to another provider. ***Conclusion:*** Despite known exposure, knowledge of the guideline was low in this sample of Canadian PT students. Nevertheless, in several key areas, unconscious adherence was high relative to the guideline-based criterion standard. With minor modifications, the vignettes are suitable for evaluating the Ambassador LBP guidelines in a larger study.

Key Words: evidence-based practice; practice guidelines as topic; low back pain; patient simulation.

RÉSUMÉ

Objectif : Nous avons étudié un processus d'évaluation de la connaissance et de l'observation, chez les étudiants en physiothérapie (PT), du guide Ambassador sur la lombalgie. ***Méthodes :*** L'étude repose sur une enquête transversale. Les participants étaient des étudiants en physiothérapie qui avaient reçu de l'information au sujet guide dans le cadre de leur cursus. Les réponses aux questions sur la prise en charge de quatre cas cliniques ont constitué les principales mesures. On a mesuré l'observation des recommandations contenues dans le guide en comparant les résultats des participants à une série de réponses « basées sur le guide » données par un physiothérapeute qui a participé à la création du guide Ambassador, considéré comme l'étalon critère. ***Résultats :*** Au total, 74 répondants ont fourni des données complètes, ce qui donne un taux de réponse de 89 %; 65 (88 %) ont déclaré ne pas connaître le guide. L'observation générale de l'étalon critère était élevée (>70 %). Les répondants ont démontré une observation importante lorsqu'il s'agit d'identifier les signaux d'alarme et de décider s'il faut référer le patient à une autre fournisseur. ***Conclusion :*** En dépit d'une exposition connue, cet échantillon d'étudiants canadiens en physiothérapie connaissait peu le guide. Néanmoins, dans un certain nombre de domaines clés, l'observation spontanée était élevée par rapport à l'étalon critère basé sur le guide. Avec quelques modifications mineures, les vignettes conviennent pour évaluer le guide Ambassador sur la lombalgie dans le contexte d'une étude de plus grande envergure.

Low back pain (LBP) continues to be a leading cause of activity limitations, participation restrictions, and visits to primary health care professionals, including physiotherapists. Surveys in Canada indicate that >80% of the general population has experienced LBP at some point.[1,2] Despite the high incidence and prevalence of LBP, the associated costs of diagnostic imaging and management, and the frequency of health care visits in this clinical population, studies of provider practice patterns have consistently shown high use of interventions poorly supported by evidence and lower use of interventions well supported by evidence.[3–5] In an effort to improve the health care management of LBP and other common pain conditions, the Institute of Health Economics in the province of Alberta, Canada, implemented the Alberta Ambassador Program,[6] a knowledge-

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translation strategy that supports best practice and promotes evidence-based management of common regional pain conditions. One major activity of the Ambassador Program was developing and disseminating a multidisciplinary clinical practice guideline (CPG) for the evidence-informed management of patients with non-specific LBP.[7,8]

CPGs are increasingly being used to synthesize best available evidence for health care providers, to inform clinical practice decisions, and to enhance the effectiveness and efficiency of care.[9] In the area of LBP, guidelines have been published in many countries over the past decade.[9–11] The most common features of current LBP guidelines are (1) identifying "specific" LBP and appropriate medical management of serious pathology; (2) providing reassurance, advice to stay active, and pain coping strategies in cases of non-specific LBP (principally self-management pain-relieving modalities); and (3) identifying negative prognostic factors. Despite the widespread availability of CPGs, adherence to their recommendations has been mixed.[12–14] For example, physiotherapists continue to use pain-relieving modalities such as traction and transcutaneous electrical nerve stimulation (TENS) even though most guidelines recommend against their use.[3,5] Since adherence to guidelines appears to lead to improved functional outcomes,[15] interventions to foster guideline knowledge and adherence have been recommended.[16–18] In an attempt to increase knowledge, authors of the Alberta Ambassador guideline synthesized earlier LBP guidelines and then summarized them into a contextually relevant CPG, a one-page patient handout, and a background document providing a full methodological description.[8] In 2009 the guideline was published on the Alberta Medical Association's Toward Optimized Practice (TOP) Web site.[19]

Evaluating clinicians' knowledge of and adherence to guideline recommendations is a challenging task. A promising evaluation strategy was developed by Rutten and colleagues, who evaluated the Dutch LBP guideline using four clinical vignettes representing case simulations of both acute and chronic LBP.[20] These vignettes were deemed to have acceptable validity and to be a feasible method of measuring physiotherapists' adherence to the guideline.[20] They were subsequently used in a survey of 472 Dutch physiotherapists that found an average guideline adherence rate of 50.4%.[21] The vignettes and survey questions have been translated into English by the developers, but additional validation work in other jurisdictions is needed before they can be more widely used in research. Since initial training is a key influence on therapists' clinical decisions in practice,[22,23] using the vignettes with a sample of physiotherapy (PT) students could provide information about their ability to adequately assess knowledge of and adherence to CPGs, as well as giving some insight into the students' future clinical practice decisions.

The purpose of our study, therefore, was to evaluate the strategy devised by Rutten and colleagues[20] to assess knowledge of and adherence to the Alberta Ambassador LBP guideline in a cohort of PT students. *Knowledge* was defined as knowing about the existence and content of the guidelines;[21] *adherence* was defined as making clinical decisions that are consistent with guideline-based recommendations.

METHODS

Study design

The study was a cross-sectional survey of PT students at the University of Alberta. The university's Health Research Ethics Board approved the study, and all participants provided informed consent.

Participants

The study used a convenience sample of PT students in the final year of the University of Alberta Master of Science in Physical Therapy (MScPT) programme, who completed the survey before a lecture in a summer-session course, which was the last course in their curriculum. Administrative support staff sent students an email message inviting them to participate in the study; those interested were asked to attend a 1-hour session, during which they completed the survey (those who did not want to participate did not have to attend). We aimed for a participation rate of at least 80% from the 83 students in the class. Participants were reimbursed $20 for their time. At the time of the study, these students were nearing completion of their programme; they had received information about the Ambassador LBP guideline approximately 6 months earlier, during two lectures in a clinical course focusing on assessment and treatment of clients with LBP and other orthopaedic conditions. The one-page guideline summary report was required reading for students in this course, and the full text of the CPG was recommended reading.

Measures

Students who attended the study session were given the pen-and-paper survey, then asked to read the vignettes and complete the associated questions. If they had questions about the survey, they were referred to one of the study investigators, available in an adjacent room to answer questions. The investigators did not answer questions about specific content of the survey or about the management of patients with LBP.

The primary measures were student responses to survey questions about the management of four clinical vignettes previously used in evaluating Dutch physiotherapists' adherence to the Dutch LBP guideline.[20] The vignettes were developed to represent patient profiles of the guideline and the variety of cases typically seen in professional PT practice. The four vignettes featured one

patient with specific LBP (clearly identifiable signs or symptoms of serious pathology, or "red flags"), one with non-specific LBP and a normal course of recovery, one with non-specific LBP at risk for a delayed course of recovery (presence of negative prognostic factors, or "yellow flags"), and one with chronic LBP. Responses to questions associated with the clinical vignettes allowed us to evaluate five essential guideline recommendations: (1) differentiating specific from non-specific LBP; (2) identifying red flags; (3) providing necessary information, advice, and referrals; (4) choosing appropriate treatment strategies; and (5) referring to other providers. Before beginning the study, we (WC, DG, GB) reviewed the English-language version of the vignettes and survey questions for clarity of content, together with graduate students in the University of Alberta's Common Spinal Disorders lab who have a clinical background in PT (3), orthopaedic surgery (1), and athletic therapy (1). No substantive textual changes were made as a result of this review. The vignettes and survey questions used in this study can be found in Appendix 1 online.

The survey also included direct questions about students' knowledge of the Ambassador LBP guideline, whether they applied it during clinical placements, and their opinions about the usefulness of the guideline (Does the guideline inform their patient management decisions? Is it a useful clinical resource? What are its key challenges and limitations? etc.). Guideline usefulness was rated on a 10-point scale (0 = not useful, 10 = extremely useful). Descriptive questions measured participants' amount of orthopaedic clinical experience and their level of experience in managing clients with LBP.

Criterion measure

To evaluate participants' adherence to recommendations in the Ambassador LBP guideline, scores were compared to a "guideline-based" set of responses from one of the authors (GC) who had been the PT representative on the guideline development panel. These were considered our criterion standard responses in the analysis; they do not necessarily represent what a PT should do in clinical practice but, rather, were used to determine what recommendations are supported by the guideline.

The criterion PT read the four clinical vignettes and completed the survey questions; while doing so, he had access to the Ambassador LBP guideline. The vignettes and his responses were reviewed by members of the Ambassador LBP guideline development team, including a psychologist and another PT; he then reviewed their feedback and compared responses to the guideline document before finalizing and submitting his responses. The psychologist concurred with all responses; the PT suggested one change that was adopted (possible referral to occupational therapy for Vignette 2) and one change that was not adopted (mobilizations for Vignette 1).

Student responses to the vignettes were then compared to these "guideline-based" criterion standard responses in the analysis. A vignette would be deemed suitable for further use in subsequent studies of practising clinicians if the student respondents were able to complete the survey without difficulty (i.e., no reported problems or uncertainty about content of the case) and within the allotted time (1 hour).

Data analysis

We used descriptive statistics to summarize available sample characteristics and participants' reported knowledge of and adherence to the LBP guideline. Survey item responses were expressed as the proportion of students choosing each response; we then calculated the proportion of responses in agreement with the guideline-based criterion standard by summing the total number of selected and non-selected student responses that were in harmony with the criterion, then dividing by the total number of responses, as follows,

$$\text{Percent agreement} = \frac{\text{total correct selections} + \text{total correct non-selections}}{\text{total possible selections}}$$

within the five main content domains (LBP classification, identifying red flags, action taken/interventions, education provided, and referrals) across all four vignettes. We also calculated overall accuracy across all content domains. Agreement with the criterion measure was judged as low if agreement was <50%, moderate if 50–70%, and high if >70%.[24] Differences observed on level of agreement with the criterion measure between respondents with and without knowledge of the guideline were tested using an independent-samples *t*-test with alpha set at 0.05. All analyses were conducted using the Statistical Package for the Social Sciences, version 19 (SPSS Inc., Chicago, IL).

RESULTS

Participant characteristics

Of the 83 PT students in the class, 75 participated in the survey and 74 (89%) provided complete data on all vignettes. Most participants had finished all clinical placement requirements for the MScPT programme, and all reported having completed at least one 6-week orthopaedic clinical placement at the time of the survey (45% had completed 1 placement, 43% had completed 2, and 12% had completed 3). Moreover, 95% of participants reported having treated clients with LBP during their clinical placement. When asked about references and resources used when managing clients with LBP, 40% cited textbooks and expert opinion (including clinical supervisors) as their primary source of treatment information. For further sample characteristics, see Table 1.

Table 1 Participant characteristics ($n = 74$)

Characteristic	% of respondents
No. of clinical placements focused on orthopaedics	
1	45
2	43
3	12
Treated clients with LBP while on placement	
Yes	95
No	5
References or resources used when managing clients with LBP*	
Textbooks/expert opinion (including clinical supervisors)	40
Entry-level training	15
Academic/research papers	3
No additional references or resources	50

*Multiple answers acceptable.
LBP = low back pain.

All participants completed the survey questions within the allotted 1-hour period. There were no questions about the vignettes or the survey questions, nor did we receive any specific feedback about errors or unclear content in the vignettes. However, we did field several questions about the Ambassador LBP guideline: five students asked for clarification about what guideline the survey was referring to.

The primary LBP classifications identified in the guideline-based criterion standard (acute/subacute non-specific vs. chronic non-specific vs. specific) all matched the LBP classifications originally assigned to the four vignettes.

Knowledge of guidelines

Despite previous exposure to and lectures on the Ambassador LBP guideline, 65 participants (88%) reported having no knowledge of it; the same number also reported that they had not applied the Ambassador LBP guideline during their clinical placements. The 9 participants (12%) who did report knowledge of the guideline rated it as moderately useful, giving an average rating of 6.2 (SD 1.3; range 5–8) out of 10. Eleven students (15%) provided suggestions on how to improve guideline uptake, including disseminating the guideline more widely and making it more readily available (6), teaching the guideline in the MScPT curriculum (4), and enhancing the treatment options available in the guideline (1).

Consistency with guideline-based criterion standard

Consistency between participant responses and the guideline-based criterion was high overall, at >75% (see Table 2), and higher when the vignette asked participants to identify whether signs of serious pathology or "red flags" were present (>90%) or to decide whether to refer to another provider (>80%). Differences observed between those who reported knowledge of the guideline and those who did not were neither statistically significant ($p > 0.05$) nor large enough to be deemed clinically meaningful (largest difference ~3%).

Responses to individual vignettes

Average agreement on each response domain for each vignette ranged from moderate (60% agreement for referral to other providers, Vignette 2) to very high (100% agreement on identifying red flags, Vignettes 3 and 4; see Table 3). Across the four vignettes, 15 out of 20 domains demonstrated consistency above 70%. Respondents demonstrated the highest levels of consistent agreement with the guideline-based criterion on Vignettes 3 and 4; agreement was lower on Vignettes 1 and 2 (see Table 2). Responses to specific items relative to the guideline-based criterion varied widely across vignettes (see Table 4).

Vignette 1

The first vignette describes a 34-year-old woman with non-specific chronic LBP, described as non-radiating and intermittent for approximately 3 years. Respondents

Table 2 Overall Congruence between Student Responses and Guideline-Based Criterion*

		Mean (SD) % agreement with criterion standard response† Reported knowledge of the Ambassador guideline‡	
	Total sample ($n = 74$)	No ($n = 65$)	Yes ($n = 9$)
Overall % agreement with criterion standard	77.9 (10.6)	77.9 (12.1)	78.5 (10.5)
LBP categorization§	69.3 (26.3)	68.8 (26.5)	72.2 (26.4)
Identifying red flags	92.9 (11.3)	93.3 (11.3)	91.7 (12.5)
Intervention provided	72.5 (4.7)	72.4 (4.7)	72.8 (4.8)
Information/advice	73.8 (6.7)	73.9 (6.9)	72.8 (5.8)
Referral to other provider(s)	81.2 (4.2)	81.0 (4.3)	82.8 (3.0)

*"Guideline-based" criterion standard set of responses from a PT who participated in the development of the Alberta Ambassador Low Back Pain Guideline, in consultation with other members of the committee.
†Agreement on selected responses plus agreement on non-selected responses divided by total number of responses.
‡No significant differences were observed between groups ($p > 0.05$).
§Acute/subacute vs. chronic; specific vs. non-specific.

Table 3 Average Level of Consistency between Students' Responses ($n = 74$) and Criterion Measure* on Individual Vignettes

	Mean (SD) % agreement†			
	Vignette 1	Vignette 2	Vignette 3	Vignette 4
Overall agreement with criterion	74.3 (7.6)	68.8 (7.0)	87.4 (5.3)	82.0 (6.2)
LBP Categorization (i.e., Acute, Chronic, Specific)	66.2 (4.8)	71.6 (4.5)	73.0 (4.5)	70.3 (4.6)
Identifying Red Flags	94.6 (2.3)	77.0 (4.2)	100 (0)	100 (0)
Intervention provided	69.5 (10.1)	61.3 (8.7)	87.0 (6.5)	72.2 (8.3)
Information/Advice	69.6 (10.4)	74.0 (11.2)	78.5 (11.5)	72.9 (9.2)
Referral to other provider(s)	71.4 (7.1)	60.2 (6.3)	98.7 (4.2)	94.5 (9.1)

* "Guideline-based" criterion standard set of responses from a PT who participated in the development of the Alberta Ambassador Low Back Pain Guideline, in consultation with other members of the committee.
† Average percent agreement with the criterion standard response (i.e., agreement on selected responses plus agreement on non-selected responses divided by total number of responses).

showed moderate agreement with the guideline-based criterion when classifying the condition as chronic LBP (55%); another 12% classified it as acute-on-chronic, which is not a response category in the guidelines but was deemed appropriate (total agreement of 66%). Over 80% of respondents agreed with the guideline-based criterion in recommending exercise therapy and providing advice to stay active; 7% recommended providing advice to lie down when the pain increases. Contrary to the criterion, 80% of respondents would attempt to explain which anatomic structure is causing the pain, and 16% would refer to a multidisciplinary rehabilitation programme.

Vignette 2

This vignette describes a 42-year-old man with non-specific acute/subacute LBP (6 weeks in duration) with abnormal course due to the presence of negative prognostic factors (fear of movement and low perceived control over the pain). Respondents showed high agreement with the guideline-based criterion when classifying the condition as acute/subacute LBP (72%), but only 32% identified the course of recovery as abnormal. The guideline-based criterion response to this vignette also did not identify it as a case of "abnormal recovery." Respondents also had difficulty in distinguishing between red and yellow flags: 23% of participants incorrectly identified red flags in this vignette. Guideline-based interventions were recommended by 61% of respondents; contrary to the criterion, 9–12% reported that they would refer to a multidisciplinary rehabilitation programme or to a physician specializing in pain or musculoskeletal medicine.

Vignette 3

This vignette describes a 53-year-old woman with signs of specific LBP and clear red flags including weight loss, night pain, and evidence of previous breast cancer. In this case, 73% of participants agreed with the guideline-based criterion in classifying the condition as specific LBP or identifying that they did not have enough information to rule out serious pathology. All respondents correctly identified the presence of red flags and recommended referral to a family physician, consistent with the criterion.

Vignette 4

This vignette describes a 46-year-old man with non-specific acute/subacute LBP (2 weeks in duration) and a typical course of recovery. In this case, 70% of respondents agreed with the criterion in classifying the condition as acute/subacute LBP. Although 100% reported no red flags, 30% did not believe they had enough information to rule out serious pathology. Over 90% of respondents recommended exercise therapy as an intervention, contrary to the criterion; 84% indicated that they would explain which anatomic structure is causing the pain; and 69% agreed with the criterion in not recommending referral to another provider.

DISCUSSION

This study evaluated whether a series of four vignettes could be used to study knowledge of and adherence to the Ambassador LBP guideline in Alberta, Canada, using a sample of graduating PT students. Results suggest that, with some minor modifications, these vignettes are suitable for examining adherence to the Ambassador LBP guideline, and thus are appropriate for evaluating adherence to this guideline in a larger study. Within our sample, despite known exposure to the Ambassador LBP guideline within the previous 6 months, knowledge of the guideline was low (88% reported that they had not heard of it); nevertheless, participants' responses on management of clients with LBP were congruent (>75% overall agreement) with guideline-based criterion standard responses. Identification of signs of serious pathology and of the need for referral was highly consistent with the guideline recommendations. Our results indicate that adherence to the guideline recommendations may reflect portions of the students' education (e.g., curriculum and clinical placements) that correspond to

Table 4 Responses to LBP Vignette Questions ($n = 74$) vs. Criterion Measure*

	Vignette 1		Vignette 2		Vignette 3		Vignette 4	
	%	Crit.*	%	Crit.*	%	Crit.*	%	Crit.*
LBP categorization								
Non-specific acute/subacute LBP with "normal" course of recovery	12		40	✓	3		70	✓
Non-specific acute/subacute LBP with "abnormal" course of recovery	13		32		15		0	
Non-specific chronic LBP	55	✓	7		9		0	
Specific LBP/not enough information to rule out serious pathology	8		20		73	✓	30	
Other (i.e., acute-on-chronic LBP)	12		1		0		0	
Were signs/symptoms of serious pathology (red flags) identified?								
Yes	7		23		100	✓	0	
No	93	✓	77	✓	0		100	✓
Interventions applied or recommended								
Advice/Provide education	100	✓	100	✓	84	✓	97	✓
Exercise therapy: practice and guidance of activities	93	✓	91		19		93	
Exercise therapy: practice and guidance of function	83	✓	83		12		91	
Thermo therapy (heat or cold)	76		57	✓	8		64	✓
Mobilization of spine and joints	52		49	✓	1		47	
Massage therapy	41		25		1		24	
Electrotherapy	39		35		1		32	
Traction/decompression therapy	28		24		0		16	
Back school/group education session	19	✓	25		3		25	
Information and advice provided								
Advice regarding work related posture	97	✓	92	✓	11		92	✓
Stay active as much as possible (as in moving/exercising)	81	✓	87	✓	20		75	✓
Explain which anatomic structure causes the pain	80		71		9		84	
Continue exercising in the future	80	✓	79	✓	19		76	✓
Avoid painful positions/postures	73	✓	53	✓	24		86	✓
Information regarding factors that may impede recovery	72		64	✓	11		65	
Explain that pain is not always related to tissue damage	60	✓	55	✓	29		23	
Resume regular activities as much and as soon as possible	44	✓	61	✓	7		49	✓
Information regarding the positive prognosis of LBP	35	✓	43	✓	3		59	✓
Advice not to undertake painful activities	35		37		16	✓	31	✓
Advice to lie down when the pain increases	7		7		1		11	
Referrals to additional providers or health care professionals								
Massage therapist	40		16		1		13	
Acupuncturist	36		12		1		9	
Physician specializing in pain or musculoskeletal medicine	21		12	✓	3		5	
Multidisciplinary rehabilitation programme	16	✓	9	✓	4		5	
Family physician	17		20		100	✓	9	
Occupational therapist	11		8	✓	0		0	
Psychologist	5		19	✓	0		0	
Chiropractor	0		1	✓	0		0	
Osteopathic physician	0		0	✓	0		0	
No, I would not refer this patient to another provider	24		35		0		69	✓

*"Guideline-based" criterion standard set of responses from a PT who participated in the development of the Alberta Ambassador Low Back Pain Guideline, in consultation with other members of the committee.
LBP = low back pain; Crit. = criterion standard response.

the content of the Ambassador LBP guideline, rather than direct knowledge of the guideline itself.

Some modifications to the vignettes and/or associated survey questions are recommended before they are used more broadly in research. Both respondents and the guideline-based criterion standard rated Vignette 2 as having a normal course of acute/subacute non-specific LBP recovery, but in fact it was designed to represent an abnormal course. This may reflect ambiguity in the wording of the question; it may also be the case that using the terms *normal* and *abnormal* to describe the course of recovery may be less than ideal. These terms are used in the Dutch LBP guideline, but not in the Ambassador LBP guideline, in addressing the identification and management of "yellow flags." The lack of explicit definitions for "normal" and "abnormal" recovery in the Ambassador LBP guideline may have contributed to the challenges respondents experienced in classifying this course of recovery (which was at 6 weeks of the guideline-defined 12-week acute/subacute phase) as

abnormal. Perhaps a survey question comparable to the "red flags" question, asking specifically about the presence of "yellow flags" or negative prognostic indicators, would be preferable. Alternatively, the results may indicate that the negative prognostic factors in Vignette 2 are too subtle. Future users of this vignette should consider clarifying or emphasizing the negative prognostic factors, making them more explicit, and possibly including other factors (e.g., depression, distress, or poor recovery expectations) that are key elements of screening tools such as the STarT Back Screening Tool and Orebro Musculoskeletal Pain Questionnaires.[25–27] It is also possible that PT students and the criterion standard clinician had difficulty in recognizing psychological factors that act as negative prognostic factors for the recovery of LBP. This would be consistent with recent research that has highlighted the barriers to embedding psychosocial perspectives within PT clinical management of LBP.[28] A recent qualitative study examining LBP guideline uptake recommended taking a multidisciplinary management approach, with physiotherapists and physicians responsible for pain management, red-flag screening, encouragement to stay active, and reassurance while occupational therapists (who have more training in psychological, social, and occupational health issues) take responsibility for disability prognosis, yellow-flag management, and return-to-activity parameters.[29] However, identifying patients at risk of delayed recovery is a challenging task.[30,31] Since recent studies have demonstrated the importance of identifying such risk factors,[25,32] future guidelines will likely need to be clearer on psychosocial issues, identifying yellow flags, and managing patients with abnormal courses of acute non-specific LBP. Some clarity is also required for the vignette intervention response option of "back school." "Back schools" are less common in Canada than in Europe; our student respondents showed their lack of familiarity with this treatment and had difficulty in determining whether to recommend it. In addition, 12% of respondents identified the chronic non-specific LBP scenario (Vignette 1) as representing "acute-on-chronic" LBP; this was not an option listed in the Ambassador LBP guideline or in the vignette response options, but future users of the vignette may need to consider adding it. an option for "recurrent" LBP may also be appropriate.

Guidelines for managing LBP have been published in several countries over the past decade.[10] Despite the widespread availability of many of these international guidelines, knowledge of and adherence to them has been largely absent.[3,5,12] Our findings mirror those of previous studies with respect to the low levels of guideline knowledge reported by participants. The Ambassador LBP guideline has been disseminated to physiotherapists and primary health care providers across Alberta and incorporated into the PT curriculum at the University of Alberta, and participants were exposed to the guideline during their clinical training, yet our findings suggest that their knowledge of this guideline was low. Adherence to the guideline's recommendations was relatively high, however, which suggests that these PT students likely received and retained information from sources other than the guideline itself. For example, the instructor of the course that introduced students to the guideline provided LBP management recommendations congruent with those of the guideline, and students may also have received guideline-congruent training from clinical placement supervisors. This finding has implications for guideline developers interested in broad implementation and evaluation of their guidelines. Developers should consider and ascertain the wide variety of modes and pathways through which end users obtain clinical knowledge.[33] Future initiatives to improve guideline knowledge and awareness may also require a more explicit implementation strategy, including a clear and meaningful title or "brand" for the guidelines.[34] For PT students specifically, vignettes such as those used in this study could be built into PT courses or online learning resources to provide case-based examples of applying and making decisions informed by the guideline.

We observed moderate agreement between respondents and the criterion measure in classifying LBP. The student participants showed higher agreement with the criterion measure in the "red flag" and acute LBP vignettes, and lower agreement in the chronic LBP and "yellow flag" vignettes, as discussed above; their level of agreement with the criterion in identifying signs of serious pathology or "red flags" was very high. Physiotherapists typically refer to physicians if they have identified red flags and suspect undiagnosed specific pathology. As physicians also commonly use a pathophysiological/medical model to classify LBP, it is very possible that, given the same vignettes and survey questions, primary-care MDs might produce similar results in terms of LBP classification. As the PT profession moves toward a greater role in using and prescribing diagnostic imaging, the accuracy of diagnostic determinations made by physiotherapists will become more important.

Participants demonstrated consistency with the criterion standard in terms of advice provided and treatment recommendations. Recommendations were typically for an active approach (therapeutic exercise and advice to stay active); a minority recommended use of pain-relieving electrical modalities or of traction, both of which have previously been common interventions by Canadian physiotherapists.[3,5] Contrary to the Ambassador LBP guideline, however, participants appeared to be guided by a biomedical focus when treating patients with LBP (e.g., explaining pain based on impairments of anatomic structures) and tended not to incorporate broader personal and environmental aspects of the condition into their recommendations (e.g., they had difficulty in recognizing an abnormal course and were unlikely to refer for

multidisciplinary care). Recent research has shown that educating clinicians in a biopsychosocial framework is critically important in preparing them to manage LBP and associated disability, and likely more important than education on biomechanical factors alone.[28,35,36] A recent published trial studied the effect of biomedically versus biopsychosocially oriented training focused on changing PT students' beliefs and attitudes and the recommendations they provide to patients.[37] Results indicated that strictly biomedical education exacerbated students' maladaptive beliefs about LBP and resulted in inadequate activity recommendations (i.e., students were more likely to advise rest or activity limitations).[37] While our participants appeared to be guided by a biomedical focus and had difficulty in identifying psychological prognostic factors, they were also very likely to recommend activity and exercise therapy (even more likely than the guideline-based criterion standard, in cases of acute/subacute non-specific LBP).

Limitations

Because this study was planned and implemented as an investigation of a survey aiming to emulate clinical scenarios and decision making, the research design had some inherent limitations. Most notably, the sample size of 74 was relatively small and drawn from a single PT class at one Canadian university. Therefore, our results may not generalize to other settings or students. Responses to the vignettes might be different among practising physiotherapists. Furthermore, clinical vignettes were the primary assessment tool used to evaluate decisions during clinical reasoning; some argue that vignettes inherently lack the detail and depth of assessment information that clinicians have available when dealing with a real patient in clinical practice, and participants' responses may therefore be more representative of their attitudes and perceptions than of their actual behaviour.[38,39] However, studies have demonstrated the validity of vignettes for measuring clinicians' performance.[40,41] Furthermore, the validity of these specific LBP vignettes has previously been tested and deemed acceptable for measuring guideline knowledge and adherence among practising physiotherapists.[20]

It is also important to note that the guideline-based criterion standard reflects responses from one therapist (supported by another PT clinician and a clinical psychologist) based on the Ambassador guideline; they do not necessarily represent what a PT should do in clinical practice. Using a single rater with peer consultation allowed us to avoid the problem of inconsistency in clinical decisions across raters seen in previous studies of LBP vignettes;[42,43] however, future studies may benefit from using a panel of qualified respondents, with a predetermined process for adjudicating differences across panellists, to improve the content validity of the criterion standard.

CONCLUSION

Despite known exposure to the Ambassador LBP guideline, our sample of Canadian PT students exhibited low knowledge of the guideline. Nevertheless, their unconscious adherence to the guideline was high in several key areas relative to the guideline-based criterion standard. With minor modifications, the clinical vignettes used are suitable for examining adherence to the Ambassador LBP guideline, and are thus appropriate for evaluating adherence to this guideline in a larger study.

KEY MESSAGES

What is already known on this topic

Guidelines are increasingly being used to synthesize best available evidence for health care providers, inform clinical practice decisions, and enhance effectiveness and efficiency of care. However, adherence to guideline recommendations has been mixed. A promising strategy for evaluating clinicians' knowledge of and adherence to guideline recommendations was developed by Rutten and colleagues, who evaluated adherence to the Dutch low back pain (LBP) guideline using four clinical vignettes representing case simulations of both acute and chronic LBP. The vignettes were deemed to have acceptable validity and to be feasible for measuring guideline adherence among physiotherapists, but they have not been tested in other jurisdictions.

What this study adds

Despite known exposure to the Ambassador LBP guideline, knowledge of the guideline was low in this sample of Canadian physiotherapy students. However, the students' unconscious adherence to the guidelines was high in several key areas relative to the "guideline-based" criterion standard. With minor modifications, the clinical vignettes used are suitable for examining adherence to the Ambassador LBP guideline, and thus are appropriate for evaluating adherence to this guideline in a larger study.

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Appendix 1: Full Survey Vignettes and Questions

Note: Patient names in these vignettes are fictitious.

VIGNETTE 1: MRS. GREEN [NON-SPECIFIC CHRONIC LBP]

Mrs. Green is 34 years old and has been complaining about low back pain and pain in her right buttock on-and-off for approximately 3 years. The level of pain varies. At times she functions reasonably well, but at other times she is in severe pain and very disabled. For the past 3 weeks she has been in considerable pain and limited in her functioning, especially in household tasks and while taking care of her children (15 months, 4 and 7 years old). She is not employed in paid work outside the home.

She has no idea why the pain has now increased again. She noticed that she felt much better during the first month after her last pregnancy, but then the pain clearly got worse. Since then she has experienced more frequent periods of increased back pain.

Since the most recent flareup pain 3 weeks ago, there aren't many signs of improvement. It is difficult for her to bend over and lift, picking her youngest child off the floor is impossible, and even carrying a bag of groceries hurts. Making beds is also very painful. When she gets up in the morning her back is sensitive and stiff. After about an hour it feels better, but during the afternoon it gets worse again. But life goes on and she tries to continue her usual activities, if necessary with a dose of painkillers (Tylenol 3 two times per day, sometimes supplemented by ibuprofen which she currently takes three per day). She has no time for hobbies, so is not limited in practicing them.

X-rays were taken approximately 1 year ago and showed disc narrowing between L5 and S1; nothing else was visible on the X-ray. She does not currently complain about impairments in sensory function. Otherwise Mrs. Green is in good health. She was treated by a physical therapist 3 years ago with massage, heat therapy, manipulation and home exercises. This provided short-term pain relief. However, she really wants to know if there is anything she can do to prevent these periods of increased pain. Because of her planned visit to the physical therapist, she did not take any painkillers.

Physical exam findings

Extension, right side-flexion and rotation to the right are clearly limited and painful. Mrs. Green indicates that the pain occurs on the right side of the low back and in the right buttock. Flexion is very limited and painful. She has the feeling that she does not have any control of her back. During palpation, the tone of the paravertebral musculature is higher on the right side than on the left. During segmental mobility examination, the motion segment L5–S1 appeared provocative for the characteristic pain. The straight-leg-raising test (SLR) is possible to 70 degrees on the right, causing pain in the back. Added dorsiflexion of the foot does not result in increased pain. On the left, SLR is possible to 90 degrees with some sensitivity behind the knee while stretching the hamstrings.

VIGNETTE 2: MR. COOK (NON-SPECIFIC ACUTE/ SUB-ACUTE LBP ABNORMAL COURSE)

Mr. Cook, a 42-year-old man, has been suffering from low back pain for the past 6 weeks. The pain started after he helped his son renovate a house. He painted the living room and hung lights, working in uncomfortable positions to reach the various spots. He did not lift any heavy objects. The pain is continuous, localized in a somewhat diffuse lumbar area and radiates to the left buttock. He called in sick due to the back pain and has still not gone back to work. Mr. Cook is a technical draftsman and has worked long days for the past 3 months due to a very busy period at work. The pain has not reduced over the past 6 weeks despite the fact that Mr. Cook lies down regularly.

Currently his back feels stiff and he avoids bending due to pain. It's also not easy for him to get up from a chair. Mr. Cook feels limited in his gardening work, his greatest hobby. He also can't go for walks, as it becomes painful after only 20 minutes. He prefers to be careful and avoid activity.

Four years ago, Mr. Cook experienced a lumbar disc protrusion that caused a great deal of pain. It took 4 months before the pain fully resided and he was able to function normally. He has never played golf again, a sport that he practiced fervently for 5 years before his back problem. He believes that playing golf caused the problem.

Mr. Cook is otherwise healthy. He was not sleeping well the past few months due to his busy work schedule, but this has clearly improved since he stopped going to work. He takes Tylenol for the pain as necessary, varying from 0 to 5 tablets per day. He would like to have X-rays, but his family doctor has explained that this would not be useful since it will not contribute to his treatment. Mr. Cook would like to function fully, without pain.

Physical examination

Mr. Cook appears to be in moderate physical condition. He experiences some pain during extension and lateral flexion, particularly to the right. These movements are not noticeably limited. While standing, active flexion of the low back is nearly impossible. While sitting on a stool Mr. Cook can tap his fingers on the floor between his feet without any problem. The straight-leg-raising test (SLR) on the left provokes only low back pain at around 80 degrees. On the right the SLR provokes stretch pain in the hamstrings at around 80 degrees. He is not willing to lift a 10-kilogram weight from the floor, because he expects it will further damage his back. Analysis of self-report questionnaires shows some fear of movement. He assesses his own control over the pain as low, and lacks confidence that he could control the pain.

VIGNETTE 3: MRS. RICE (SPECIFIC LBP)

Mrs. Rice is 53 years old and has been reporting increasing pain in her low back for several months. The pain is located in the low back, but she can't point out the exact spot. Although the pain bothers her during the day, she is able to function reasonably well. She does not feel that her back is stiff. However, at night the pain increases and becomes severe, causing her to wake up several times per night. She then gets out of bed until it decreases somewhat. She has no energy and has therefore stopped exercising. In addition, she called in sick 2 days ago. She is not reporting impairments in sensory or muscle function in her legs. She does feel as though she has lost weight and is happy about this.

In an attempt to reduce the pain, she started taking Tylenol 2 weeks ago. Unfortunately it doesn't offer much relief. She also uses warm showers in the mornings and heat packs in the evenings which provide temporary relief of her pain.

Mrs. Rice had an episode of low back pain 2 years ago, which was treated with physical therapy. She states at the time she had a problem with the disc. Physical therapy offered good relief although it took almost 3 months for her complaints to disappear completely. She would like to know whether or not she has a repeat disc problem and what she can do about it herself. No medical consultation or examination has yet been performed for the current complaints.

Physical examination

Observation identified a well-healed surgical scar indicating previous mastectomy. This surgery took place 1 year ago. Examination of the spine results in pain during flexion and extension. Neurological examination (i.e., SLR) is negative. Strength of the back, abdominal, and legs muscles is within normal limits, although any exertion is painful in the low back. No other impairments are observed.

VIGNETTE 4: MR. FLEMING (NON-SPECIFIC ACUTE/ SUB-ACUTE LBP NORMAL COURSE)

Mr. Fleming is a 46-year-old man who reports low back pain. The pain has been present for 2 weeks and was severe initially, but decreasing for the past 4 days. Currently the pain is located in the low back on both sides, but worse on the left. The pain radiates slightly to his left side. Mr. Fleming has no complaints regarding his legs. The pain started at work one morning when he lifted a box of paper and "felt something pop in his back." Within several hours the pain had dramatically increased and that afternoon his colleagues at the municipal outdoor services department sent him home. According to Mr. Fleming, he was unable to function the first few days. He rested in bed and infrequently did some walking around, as it was difficult for him to get out of his bed. His family doctor prescribed painkillers (Tylenol 3) and Mr. Fleming took the last tablet the day before yesterday.

Two days ago Mr. Fleming started working again for 1–2 hours per day, although with some difficulty, especially the first day. He is not yet able to lift and carry weights, which he considers too heavy. He is also unable to do anything requiring bending or standing in a bent-over position. He would like to re-join his bicycle club for their weekly bicycle rides and expects he will be able to do so within a few weeks. The family doctor referred him to physical therapy with a diagnosis of low back pain.

Mr. Fleming has had the same complaints before, but with lower pain intensity and usually lasting only 2–3 days. The last episode took place about 2 years ago. His family doctor has examined his back, but he has not had any diagnostic imaging tests. He is otherwise healthy but on medication for high cholesterol. Six years ago he underwent knee surgery on his right meniscus and he has fully recovered.

Physical examination

Demonstrated a slight restriction of flexion and left side-flexion as well as a moderate restriction of extension in the low back. These movements are painful at

end range. He cannot smoothly move up out of the flexed position into standing. Mr. Fleming feels that he must tightly control his movements and he is able to do so. Mr. Fleming is well able to keep his loaded back stable while standing and sitting. Neurological tests are negative. A little less than a year ago he was given on-the-job training on how to safely lift objects, and he is now able to demonstrate what he learned. He does indicate that he does not consistently apply these techniques while working, although he could do so.

QUESTIONS FOR EACH VIGNETTE

1. I categorize this patient as follows, based on the current information:
   - ○ Specific low back pain
   - ○ Non-specific low back pain in acute/sub-acute phase with a normal course
   - ○ Non-specific low back pain in acute/sub-acute phase with abnormal course
   - ○ Non-specific low back pain in the chronic phase
   - ○ I'm unable to categorize this patient
   - ○ Other, please specify _____

2. Have red flags been identified?
   - ○ Yes, namely: _____
   - ○ No

3. Mark which actions you would apply in this patient's case. Multiple answers are acceptable.
   - ○ Advice/Provide education
   - ○ Back school/group education session
   - ○ Exercise therapy: practice and guidance of activities (including explanations)
   - ○ Exercise therapy: practice and guidance of functions (including explanations)
   - ○ High frequency electrotherapy (e.g., UKG)
   - ○ Massage therapy
   - ○ Mobilization of spine and joints
   - ○ Manipulation of spine and joints
   - ○ Low and middle frequency electrotherapy
   - ○ Thermo therapy (heat, cold)
   - ○ Traction/decompression therapy
   - ○ Ultrasound therapy (US)
   - ○ Yoga
   - ○ Other, please specify _____

4. How many treatment sessions do you expect for this patient?
   - ○ 1–3
   - ○ 4–6
   - ○ 7–9
   - ○ 10–12
   - ○ More than 12
   - ○ I don't know

5. What information and advice would you provide to this patient? Multiple answers are acceptable.
   - ○ No information
   - ○ Explain which anatomic structure(s) cause(s) the pain
   - ○ Explain that pain is not always related to tissue damage
   - ○ Information regarding the positive prognosis of low back pain
   - ○ The advice not to undertake painful activities
   - ○ The advice to avoid painful positions/postures
   - ○ The advice to lie down when the pain increases
   - ○ The advice to continue exercises in the future
   - ○ The advice to stay active as much as possible (as in moving/exercising)
   - ○ The advice not to go back to work for a while (2–3 weeks)
   - ○ The advice to resume regular activities as much as possible, as soon as possible
   - ○ The advice to exercise regularly in the future
   - ○ The advice to rest more in the future
   - ○ Advice regarding work related posture (incl. household tasks)
   - ○ Information that frequent changes in posture strain the back
   - ○ Advice regarding the work/home environment
   - ○ Information regarding factors that may impede recovery
   - ○ Other, please specify _____

6. Would you refer this patient to another provider? Multiple answers are acceptable.
   - ○ Acupuncturist
   - ○ Chiropractor
   - ○ Family physician
   - ○ Massage therapist
   - ○ Multidisciplinary pain program
   - ○ Multidisciplinary rehabilitation program
   - ○ Naturopath
   - ○ Occupational therapist
   - ○ Osteopathic physician
   - ○ Physician specializing in musculoskeletal medicine
   - ○ Physician specializing in pain management
   - ○ Psychologist
   - ○ Surgeon
   - ○ Other, please specify _____
   - ○ No, I would not refer this patient to another provider.