Knowledge translation from continuing education to physiotherapy practice in classifying patients with low back pain

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Objectives: Physical therapists have used continuing education as a method of improving their skills in conducting clinical examination of patients with low back pain (LBP). The purpose of this study was to evaluate how well the pathoanatomical classification of patients in acute or subacute LBP can be learned and applied through a continuing education format. The patients were seen in a direct access setting.

Methods: The study was carried out in a large health-care center in Finland. The analysis included a total of 57 patient evaluations generated by six physical therapists on patients with LBP. We analyzed the consistency and level of agreement of the six physiotherapists' (PTs) diagnostic decisions, who participated in a 5-day, intensive continuing education session and also compared those with the diagnostic opinions of two expert physical therapists, who were blind to the original diagnostic decisions. Evaluation of the physical therapists' clinical examination of the patients was conducted by the two experts, in order to determine the accuracy and percentage agreement of the pathoanatomical diagnoses.

Results: The percentage of agreement between the experts and PTs was 72–77%. The overall inter-examiner reliability (kappa coefficient) for the subgroup classification between the six PTs and two experts was 0.63 [95% confidence interval (CI): 0.47–0.77], indicating good agreement between the PTs and the two experts. The overall inter-examiner reliability between the two experts was 0.63 (0.49–0.77) indicating good level of agreement.

Discussion: Our results indicate that PTs' were able to apply their continuing education training to clinical reasoning and make consistently accurate pathoanatomic based diagnostic decisions for patients with LBP. This would suggest that continuing education short-courses provide a reasonable format for knowledge translation (KT) by which physical therapists can learn and apply new information related to the examination and differential diagnosis of patients in acute or subacute LBP.

Keywords: Knowledge translation, Low back pain, Clinical examination, Clinical reasoning, Pathoanatomical classification, Continuing education

Introduction

Several studies have shown that early management of non-specific low back pain (LBP) prevents both the development of chronic pain and prolonged sick leave.^{1–8} In many countries, early LBP management is emphasized when training physiotherapists (PTs) for direct access, including Great Britain, the Netherlands, Norway, Finland, the USA, Canada, and Australia. Results of surveys for early PT management of patients with LBP have been positive, from the patient's point of view, as well as with respect to the costs associated with return to work.⁹ Several studies have revealed the need for better classification of LBP.^{10–12} In chronic LBP, when comparing classification-guided intervention (CSPI) to generalized postural intervention (GPI), in sub-

groups of patients with non-specific LBP (NSLBP), CSPI produced statistically and clinically significant improvements in disability and pain outcomes.¹³ Subsequent studies have further refined the existing guidelines for classifying patients with NSLBP using more detailed examination criteria.^{14–18} However, to date, there is no consensus on which of the LBP classification systems is more accurate or appropriate in the early phase of LBP, and praxis varies.^{9,19} Nevertheless, the question arises as to whether or not PTs can learn to apply a specific classification system for patients with non-specific LBP within the context of a continuing education course.

One purpose for using continuing education training to teach a specific classification system (i.e. pathoanatomical classification for non-specific LBP for PTs) has been to update professional expertise for those working in direct access settings. However, no studies have demonstrated the effectiveness of con-

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Figure 1 Flow of knowledge translation (KT) through the study.

tinuing education training, or the associated knowledge translation (KT), that occurs as a result of this training method.²⁰ Here, we investigated KT between continuing education training and clinical practice by examining physiotherapy evaluations drawn from patients' visits in order to elucidate the PTs' clinical reasoning and decision-making processes. We analyzed the conclusions drawn from the pain history, interviews, clinical findings, and test results and compared them with those of the expert PTs.

The purpose of this study was to evaluate how well physical therapists can learn the skills associated with pathoanatomical classification of patients with LBP consequent to training provided in a continuing education short course.

Methods

At the start of this research, permission for this study, which included all ethical aspects, was signed by the CEO of the city health-care center. The study material was collected at a single Finnish health-care center and included the documentation for the treatment of 57 patients, which was written by six PTs, who had completed the continuing education training. Two experienced physiotherapy experts also analyzed those documents. They were blinded to the original PTs' decisions and to each other's decisions. The experts made their own decisions according to the documented clinical histories and examinations. The flow of KT through the study is depicted in Fig. 1.

The written documents of the six PTs (four females, two males; work experience from 4 to 24 years; Table 1) from two health care departments in the same center were analyzed in the study. These six PTs had participated in a 5-day intensive course entitled 'Physiotherapy for LBP in the early phase; physiotherapeutic examination and instruction', 1 year

Duration	Contents	Instructor
2 Contact days	<ul style="list-style-type: none"> - Differential diagnosis in musculo-skeletal medicine - Symptoms and signs - Psycho-social factors - Red flags - Guidelines for medication 	MD, specialist in rehabilitation medicine
3 Contact days	<ul style="list-style-type: none"> - Clinical reasoning in physiotherapy - Clinical guidelines of LBP physiotherapy - Clinical tests (theory and praxis) - Subclassification (theory and praxis) - Therapeutic exercise and advice 	2 PTs with OMT-education, OMT instructors, MSc, PhD
12 Hours	<ul style="list-style-type: none"> - Independent training of clinical tests in groups at workplace in between contact days 	Peer mentors

Figure 2 Main contents of continuing education training for physiotherapists (PTs) regarding the direct access of patients with low back pain in its early phase (<12 weeks).

earlier (Fig. 2). The patients were seen in a direct access setting. The PTs were also unaware of the ongoing study so that they would not change their normal routines during performance of the clinical examinations.

Physiotherapists participating in this continuing education training were able to apply the LBP classification system during and immediately after the training in their normal practice. However, the PTs started to work in direct access approximately 1 year (one PT after only one month) following the training.

The chief physical therapist at the clinic, who was not involved in this study, selected all the reports from the health-care center's Pegasos system database between October and December 2011. The patients' personal identification numbers and the PTs' names were removed.

Two experienced expert PTs analyzed these documents while blinded to the original diagnostic decisions of the six PTs. The reviewers made their own physiotherapy decisions according to the docu-

Table 1 Demographics of participating physiotherapists and patients

	Female	Male
Physiotherapists		
Sex (n)	4	2
Mean age (SD), years	34.3 (7.5)	30.0 (4.2)
Mean work experience (SD), years	15.2 (8.5)	9.0 (4.9)
Patients		
Sex (n)	35	22
Mean age (SD), years	42.3 (20.3)	39.8 (19.3)

mented clinical histories and examination results. The reliability was evaluated based on the consistency of the decisions between the expert reviewers and the six PTs. The work experience of the two reviewers, as both PTs and tutors, was about 40 years each. In addition, they each had 3 years of specialized PT training in the field of orthopedic manual physiotherapy (OMT). One of the PTs had a master's degree in health care and the other had a doctoral degree in health sciences.

The clinical subgroups were divided into the following pathoanatomical/tissue-structure classification levels (modified from Refs. ^{21–23}): discogenic pain, clinical instability, clinical lumbar spinal stenosis, segmental dysfunction/facet pain (joint locking), and sacroiliac joint pain/dysfunction (Appendix). We previously demonstrated the sensitivity and specificity of the clinical tests used to distinguish clinically relevant subgroups in the early phase of LBP management.^{17,18} Based on these studies, the intra- and inter-reliability of the clinical tests used for this study and the clinical test clusters to determine the classification level is good for different testers.²⁴ The patients' symptoms and onset of the pain mechanism served as the basis for clinical reasoning in the diagnostic decision-making process (Appendix).

A total of 57 reports were selected for the study (5–12 reports from each PT). The records were from 35 females and 22 males, ages 14–88 years, with mean ages of 42.3 and 39.8 years for females and males, respectively (Table 1).

The therapists used a standard form for recording their findings. This form included the patient's current state, history, positive test results, and conclusions. After the conclusions were removed from the reports, the two expert reviewers independently analyzed the entries. They were advised to make pathoanatomical, tissue-level diagnostic decisions based on the recorded history, as well as

the examination results. If the report referred to anything other than the classification system described above, the number 6 was recorded, and if the evaluator was not in a position to make a conclusion on the basis of the records, the decision was given the number 7. Reviewers were also instructed to write which clinical test results they would need to confirm their conclusions.

The level of agreement between the decisions of the reviewers and six PTs was calculated and expressed as a percentage of the PTs' combined conclusions. Consistency was also assessed by the statistical coefficient kappa (*K*) (95% CI). The review also included decisions on the subgroup distribution. The *K* value can be interpreted as <0.20 (poor), 0.21–0.40 (fair), 0.41–0.60 (moderate), 0.61–0.80 (good), and 0.81–1.00 (very good).²⁵

Results

The PTs and reviewer 1 agreed on 77% of all cases, with a *K* coefficient of 0.69 (Table 2). The PTs and reviewer 2 agreed on 72% of all cases, with a *K* coefficient of 0.64 (Table 3). The expert reviewers mutually agreed on 74% of the cases, with a *K* coefficient of 0.63 (Table 4). Comparing the two reviewers with the six PTs, the overall agreement was 74%, and the *K* coefficient was 0.63 (Table 5).

The decisions of the PTs were segmental dysfunction/facet pain (23 patients), clinical instability (13), and SIJ pain/dysfunction (10). The reviewers' decisions also included the same subcategories. The lowest levels of agreement were in the first and third subcategories (discogenic pain and clinical spinal stenosis) (Tables 2–5). Reviewer 2 could not classify six patients into any clinical subgroup because of missing data in the reports and two patients were unsuitable for any of the LBP subgroups due to comorbid health conditions. Subgroup distribution data are presented in Table 6.

Table 2 Inter-examiner reliability of the classification of 57 patients with low back pain between six PTs and reviewer 1. Each PT examined 5–12 of his/her own patients

LBP ¹ classification	PT ² 1	PT ² 2	PT ² 3	PT ² 4	PT ² 5	PT ² 6	Reviewer 1	Agreement%	Kappa (95% CI ³)
Number of patients ⁴	10	12	11	8	11	5			
Discogenic pain	2	0	1	0	0	0	5	60	
Clinical instability	1	7	0	1	3	1	10	77	
Clinical lumbar spinal stenosis	0	0	0	0	0	0	2	0	
Segmental dysfunction/facet pain	3	3	8	2	5	2	27	85	
Sacroiliac joint pain/dysfunction	2	1	0	3	2	2	11	91	
Other classification	2	1	1	1	1	0	2	33	
Not classified	0	0	1	1	0	0	0	0	
Overall agreement and Kappa								77	0.69 (0.54 to 0.83)

LBP=low back pain.

PT=physiotherapist.

CI=confidence interval.

Each PT had their own patients.

Discussion

The aim of this study was to determine how pathoanatomical classification of patients with LBP in its early phase is transferred into clinical practice after a short, intensive continuing education training session. The participating PTs used this LBP classification during and immediately after the continuing education training in their normal practice, making it possible to implement the new knowledge right away. This KT was evaluated by two PT experts from patients' reports written by the six PTs.

The LBP pathoanatomical classification levels derived from patients' records by PTs working in direct access were relatively reliable when compared to those assigned by two expert reviewers. The *K* coefficient between the PTs and reviewers was considered good.²⁵ However, more diversified use of

clinical tests and test clusters, more detailed PT reports, or both, are essential in order to improve the level of agreement in classifying patients with LBP.

Some discrepancies were noted between the PTs' and reviewers' classifications. This was especially true

Table 6 Diagnostic subgroup distribution of 57 patients with low back pain

LBP classification	6 PTs	Reviewer 1	Reviewer 2
Discogenic pain	3	5	5
Clinical instability	13	10	10
Clinical lumbar spinal stenosis	0	2	0
Segmental dysfunction/facet pain	23	27	19
Sacroiliac joint pain/dysfunction	10	11	12
Other classification	6	2	3
Not classified	2	0	8

Table 3 Inter-examiner reliability of the classification of 57 patients with low back pain between six PTs and reviewer 2. Each PT examined 5–12 of his/her own patients

LBP ¹ classification	PT ² 1	PT ² 2	PT ² 3	PT ² 4	PT ² 5	PT ² 6	Reviewer 2	Agreement%	Kappa (95% CI) ³
Number of patients ⁴	10	12	11	8	11	5			
Discogenic pain	2	0	1	0	0	0	5	60	
Clinical instability	1	7	0	1	3	1	10	77	
Clinical lumbar spinal stenosis	0	0	0	0	0	0	0	0	
Segmental dysfunction/facet pain	3	3	8	2	5	2	19	83	
Sacroiliac joint pain/dysfunction	2	1	0	3	2	2	12	83	
Other classification	2	1	1	1	1	0	3	50	
Not classified	0	0	1	1	0	0	8	25	
Overall agreement and Kappa								72	0.64 (0.49–0.78)

LBP: low back pain

PT: physiotherapist.

CI: confidence interval.

Each PT had their own patients.

Table 4 Inter-examiner reliability of subgrouping 57 patients with low back pain into diagnostic categories between expert reviewers

LBP classification	Reviewer 1	Reviewer 2	Agreement%	Kappa (95% CI)
Discogenic pain	5	5	100	
Clinical instability	10	10	100	
Clinical lumbar spinal stenosis	2	0	0	
Segmental dysfunction/facet pain	27	19	70	
Sacroiliac joint pain/dysfunction	11	12	92	
Other classification	2	3	67	
Not classified	0	8	0	
Overall agreement and Kappa			74	0.63 (0.49–0.77)

Table 5 Inter-examiner reliability of the classification of 57 patients with low back pain between six PTs and two reviewers. Each PT examined 5–12 of his/her own patients

LBP classification	6 PTs	2 Reviewers	Agreement%	Kappa (95% CI)
Discogenic pain	3	5	60	
Clinical instability	13	10	77	
Clinical lumbar spinal stenosis	0	1	0	
Segmental dysfunction/facet pain	23	23	100	
Sacroiliac joint pain/dysfunction	10	11	91	
Other classification	6	2	33	
Not classified	2	8	25	
Overall agreement and Kappa			74	0.63 (0.47–0.77)

when additional discriminatory tests, which were taught in the continuing education program, were not used. In an effort to exclude discogenic pain, the reviewers would have preferred to use the disc load test while sitting (the modified SLUMP test), if the straight-leg raise (SLR) test was negative. Furthermore, in identifying clinical instability, sacroiliac joint pain, and/or facet pain, the reviewers would have employed additional discriminatory tests in these subcategories, for example, the use of a pelvic belt support during the one-leg stance test, the active straight-leg raise (ASLR) test, or the use of manual traction when performing standing lumbar extension. If signs and symptoms, age, history, and possible previous spinal surgery indicated the possibility of spinal canal narrowing, the reviewers would also have suggested using a half-minute-maximum standing extension test (Appendix).

This study has some limitations. Because the analysis included a total of 57 patient evaluations generated by only six physical therapists, we cannot generalize the results to the other PTs working in direct access after the same training. The focus of this study was on the utility of a single back pain classification system – for which the PTs had undergone continuing education training. Therefore, we cannot generalize these results to another classification system.

The two reviewers were also teachers in the continuing education course, meaning that the content of this education was familiar. An evaluator unfamiliar with this classification system might have drawn different conclusions from the record. On the other hand, the focus of this study was on this specific classification system, which has been previously demonstrated to be appropriate.¹⁸ In the present study, patients with LBP evaluated by the PTs were in the early phase of their pain, whereas, for prolonged or chronic back pain, it is recommended to use the movement or control impairment classification by Ösullivan.¹⁴ Furthermore, the reviewers made their conclusions based solely on records of the data from PTs in this study, but not all of the information that they collected was in their reports (e.g., more information from patients' interviews and negative test results). These factors may have influenced the PTs' conclusions but their absence also made it harder for the expert reviewers to reach their own conclusions. Thus, some of the discrepancies in the experts' lack of consensus may be explained by the fact that they had different interpretations of the original PTs' notes. Although both experts had considerable experience in the field, they evaluated the reports in different manners. One was cautious in making (or not) a PT diagnosis because of incomplete notes, while the other attempted to assign a PT

diagnosis fitting into one of the five categories despite imperfect data. Nevertheless, our results are important and suggest that short, but intensive, continuing education training can transfer knowledge regarding LBP classification to PTs at a moderately good level. Our findings should be taken into consideration when developing this kind of continuing education training. The timing between the educational course and the evaluation of the PTs' clinical practice might also partially explain our only moderately good level of agreement.

It is important to note that we did not analyze whether use of this classification system had any influence on the therapy plan or on treatment outcomes. However, the results suggest that PTs participating in this study benefitted from the continuing education training, in terms of clinical reasoning and diagnostic decision-making processes. Evidence of their enhanced preparation was seen in the quality of the patients' clinical examination, in clinical reasoning and in diagnostic conclusions.²⁶

In the future, a similar study of a larger group of PTs should be performed to assess the validity of our findings. In addition, it is also important to investigate the effectiveness of this kind of continuing education training in order to determine whether or not this leads to fewer patient visits, improvements in functional outcomes, and/or a decrease in pain in patients with LBP.

Conclusion

It appears that PTs with direct access to patients were able to apply what they had learned in a continuing education course for examination of patients with LBP. The course participants' diagnostic decisions were generally in agreement with those of two experts.

Our results suggest that short but intensive continuing education training sessions can transfer knowledge regarding classification of patients with NSLBP to clinical practice, at least at a moderately good level.

Disclaimer Statements

Contributors Eira Karvonen was the principal author in the planning, methodology and in analysis of the data. Markku Paatelma was involved in the planning of the study, methodological considerations, analysis of the data, and also involved in the manuscript. Jukka-Pekka Kesonen was responsible for statistical analysis of the data. Ari O Heinonen was involved in the planning of the study, methodological considerations and critically revised the manuscript for its content. All authors have read and approved the final manuscript.

Appendix: Pathoanatomical, Tissue-Level of Classification of LBP (Adopted from Refs. 17,18)

Disogenic pain	Clinical lumbar instability	Clinical lumbar spinal stenosis	Segmental dysfunction/facet pain	Sacroiliac joint pain/dysfunction
<p><i>Symptoms and clinical findings</i></p> <p>When a patient's pain (local or referred) could be provoked in modified slump test and when movement into extension was less painful or alleviated the same pain (centralized).</p> <p>Disogenic pain was recorded also when radiating pain was provoked by positive sciatic (SLR) or a femoral nerve tension test (PNB).</p> <p><i>Physiotherapy guidelines</i></p> <p>Pain-free positions, where intradiscal pressure or nerve compression was minimal, were advised. Manual traction was recommended, but if no symptom relief, neural tissue mobilization was recommended.</p>	<p><i>Symptoms and clinical findings</i></p> <p>Diagnosis was recorded when the patient reported LBP and fatigue during prolonged sitting/standing/lying down, and when pain during extension was relieved and movement increased with traction. In addition, this classification was made for difficulties in a one-leg stance or active straight-leg raise (ASLR) or both, or inability to activate either transverse abdominis or lumbar multifidi combined with local interspinal pain, or a combination of these problems.</p> <p><i>Physiotherapy guidelines</i></p> <p>Work and leisure time ergonomics were recorded. Movement control and positions of low back were instructed. Muscle strength and endurance, and especially stretching of hip flexors were advised.</p>	<p><i>Symptoms and clinical findings</i></p> <p>Diagnosis was recorded when the patient reported a clear pattern of intermittent claudication provoked by extension, which was relieved by sitting or a flexed spinal posture. Symptoms and signs could be combined with tightness of hip flexors or a positive sciatic (SLR) or a femoral nerve tension test (PNB).</p> <p>Diagnosis was recorded when the patient reported radiating pain with nerve tension tests and during extension/lateral flexion toward the symptomatic side or during transverse-process provocation, or both.</p> <p><i>Physiotherapy guidelines</i></p> <p>Manual or auto traction in pain-free positions was advised. Flexion-type exercises and stretching of hip flexors were advised. Upper lumbar spine mobility exercises were performed.</p>	<p><i>Symptoms and clinical findings</i></p> <p>Diagnosis was recorded when pain and movement restrictions were identified during physiological movements in standing and painful hypomobility while lying prone.</p> <p><i>Physiotherapy guidelines</i></p> <p>The lower back was stabilized with the sport tape in the acute phase for 2-3 days. After pain relief, segmental mobilization and muscle stretching were performed. Auto mobilization of hypo mobile segments and muscle stretching were advised.</p>	<p><i>Symptoms and clinical findings</i></p> <p>Diagnosis was recorded if the patient's lower lumbar or buttock pain was provoked while standing on one leg and was relieved with a sacroiliac joint belt or provoked with sacral thrust or during posterior pelvic pain provocation (PPPP) or both, or if pain and difficulties occurred during an ASLR.</p> <p><i>Physiotherapy guidelines</i></p> <p>If pain provocation or alleviation tests were positive, mobilization was performed in a pain-free direction. If all directions of movements were painful, stabilization exercises were advised. The sacroiliac joint was stabilized with belt, if exercises were painful.</p>

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Conflicts of interest There is no conflict of interest between the authors and financial or personal relationship with other people or organizations according to this study.

Ethics approval The study protocol was approved by the CEO of Helsinki City Health Care Centre 8th February, 2012.

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