Inter-rater reliability and validity of the screenassist lumbar questionnaire: a pilot study

Shala Cunningham^{1,2}

¹University of Evansville, IN, USA, ²Ola Grimsby Institute, UT, USA

Objective: The purpose of this study was to examine the validity and test–retest reliability of the ScreenAssist Lumbar Questionnaire (SALQ). If a high degree of reliability and validity could be determined, the questionnaire could provide physical therapists with a formal instrument to assist with the identification of patients with nonmusculoskeletal back pain or emergent musculoskeletal causes of back pain requiring referral to an alternate medical provider.

Methods: Participants were patients presenting to an internal medicine physician's office with the main complaint of low back pain over a 6 months period. ScreenAssist Lumbar Questionnaire was performed twice on each patient within 48 hours of the appointment. A 4-month post-visit chart review was performed to compare scores and recommendations made by the questionnaire with the assessment and diagnosis made by the physician.

Results: The SALQ demonstrated a sensitivity of 0.100 (95% CI: 0.689–0.100) and specificity of 0.786 (95%CI: 0.492–0.951) compared to the assessment and diagnosis performed by the primary care physician. Overall, regarding the recommendation for referral, there was agreement on 20 of the 21 patients with a Kappa of 0.798.

Discussion: The overall test–retest reliability and validity for referral recommendation were high, which indicates that the SALQ may serve as an alternative to the use of red flags in isolation to assist the physical therapist in determining the need for medical referral as the practice continues to progress toward direct access. The positive outcome of this study supports the possible future benefit of the SALQ.

Keywords: Low back pain, Medical screening, Physical therapists

Introduction

Medical screening for physician referral is a critical element of the physical therapy examination that has been emphasized as the profession continues to progress toward autonomous practice under direct access and serves as an entry point into the healthcare system. It is the responsibility of the physical therapist to refer patients to appropriate healthcare providers when signs and symptoms are present that require services beyond the physical therapist's scope of practice.^{1–5} When patients do present with non-musculoskeletal symptoms, determining the most appropriate referral and how to communicate the therapist's concerns can be challenging. The use of red flag symptoms has traditionally been used to screen for medical pathology.^{1–5} However, the use of red flag symptoms in isolation may produce multiple false positive results generating unnecessary diagnostic testing and further health care expense.^{4,6}

In addition to the use of red flag indicators, history taking is imperative in the assessment process.^{1,3,5} The ScreenAssist Lumbar Questionnaire (SALQ) was developed to provide physical therapists with a tool that could be used to assist with the medical screening process by supporting them in the collection of relevant information in the patient interview to perform a thorough systems review.⁷ Furthermore, the questionnaire assists in rating the severity of symptoms and clustering of symptoms, in order to support the therapist's clinical reasoning process to determine the need for medical referral.

A previous pilot study has shown that the SALQ has a negative likelihood ratio of 0.11 (95% CI=0.01, 1.54) and a positive likelihood ratio of 9.36 (95% CI=2.78, 32) for determining the presence of non-musculoskeletal or emergent musculoskeletal pain when compared to the assessment and diagnosis made by primary care providers in patients presenting with the primary complaint of low back pain.⁷ Reliability of the SALQ has not been assessed. During the development of the current inter-rater

*Correspondence to: Shala Cunningham, University of Evansville, IN, USA. Email: sc23@evansville.edu

reliability study, the phrasing of the questions was modified by the developers to assist with consistency between raters. Therefore, the revised SALQ used in this study was also examined for criterion validity. The purpose of the current study was to examine the validity and test-retest reliability of the SALQ. If a high degree of reliability and validity could be determined, the questionnaire could provide physical therapists with a formal instrument to assist with identification of patients with non-musculoskeletal back pain, or emergent musculoskeletal causes of back pain, requiring referral to an alternate medical provider. Therefore, the purpose of the present study was to address the following questions: (1) does the score and the associated recommendation for referral on the revised SALQ correspond with the results of the assessment by an internal medicine physician managing clients with the primary complaint of low back pain when a 4 months post-visit chart review is performed? and (2) Is there agreement between inter-professional raters on the individual questions and overall scoring of the SALQ?

Participants and Methods

The SALQ (Appendix A) consists of 29 questions scored between 0 and 5. The ranking of symptoms can assist the therapist in determining when the threshold for a medically related diagnosis is met. For example, question 1 is utilized to establish if the patient has had the constitutional symptom of fever over the last 2 weeks. A score of 3 on that question indicates that the medical definition of fever has been met at 99.5°. A score of 5 (i.e. recorded temperature of 103° or higher) indicates the need for an immediate referral based on that red flag symptom in isolation. The questions incorporate the information to be collected during the medical screening process to include constitutional symptoms and symptoms related to the gastrointestinal system, the genitourinary system, neurology, rheumatology, and hematology. The scores related to the questions are then clustered for interpretation. Using a cluster of symptoms is consistent with evidence-based screening approaches to determine when non-musculoskeletal pathology is present.⁸ However, these interpretations are recommendations only and do not replace the clinical reasoning process. The therapist should consider the recommendation in relation to the patient's medical history, procedural history, and medication regimen. Furthermore, not all questions are used in the scoring. Several questions are present to assist the therapist in communicating useful information during the referral process to aid with further assessment decisions.

The research study was approved by the University of Evansville Institutional Review Board, informed consent was obtained, and the rights of the participants were protected. In preparation for the inter-rater reliability study, the SALQ was reviewed by the three clinicians in the study including a nurse, a physical therapist, and a physician for comprehension of the questions by patients. The

questions were also discussed to determine uniformity in the phrasing of the questions to the patients. The healthcare professionals each had over 15 years experience were practicing in outpatient clinics. Based on this discussion, the 29 questions were modified for consistency throughout the questionnaire and enhanced understanding of the associated scoring by the healthcare professionals. These changes included adding timeframes for symptom occurrence and writing full sentences to describe each of the symptoms. For example, item one in the original SALQ simply stated the word, fever, to describe the symptom. The modified SALQ further explained the symptom by adding the following phrase: In the last 2 weeks have you had a fever? The primary symptom does remain bold in the modified questionnaire. To determine if the changes in the phrasing of the questions affected the validity of the SALQ, a repeat pilot validity study was performed in addition to the inter-rater reliability study.

Participants

The study sample consisted of 27 consecutive patients over a 6-month period with new onset of low back pain presenting to an outpatient internal medicine physician's practice for evaluation. The inclusion criteria were identical to the previous pilot validity study on the SALQ.⁷ These were (1) low back pain bound superiorly by T12 and inferiorly by the buttock crease with or without lower extremity symptoms, (2) pain present more than 24 hours, (3) age greater than 18 years, (4) the ability to read and understand the English language, and (5) being alert and oriented to person, place, time, and situation.^{7,8} Exclusion criteria were (1) the scheduled appointment being for exacerbation of existing, previously diagnosed low back pain and (2) the inability to contact the patient within the prescribed timeframe to complete the questionnaire. Consent was obtained to permit collection of the questionnaire and demographic information, as well as for the review of medical records 4 months after the visit.

Test methods

Patients in the study received a consult by the internal medicine physician followed by two phone conversations to collect demographic information and complete the SALQ. An internal medicine physician conducted a focused history and physical examination of the patient. Diagnostic imaging and testing were performed for patients when severe or progressive neurologic deficits were present or when underlying conditions were suspected on the basis of the history and physical examination. The physician participating in the study was proficient in clinical practice according to the Joint Clinical Practice Guideline from the American College of Physicians and the American Pain Society for the evaluation and management of low back pain.^{9,10}

Following the physician's consultation, the patients were contacted by phone within 24 hours of the appointment to

Figure 1 Flow diagram of patient participation.

answer any questions regarding the study, collect demographic data, and perform the SALQ. The patients were initially contacted by the physical therapist. Nursing was then notified and a second phone call to repeat the SALQ was performed within 24 hours of the first phone contact. Therefore, within 48 hours of their initial appointment for low back pain, the patient had completed the initial and follow-up performance of the SALQ. Both the physical therapist and nurse utilized a standard script for the phone call to avoid inconsistency in performance of the SALQ. The rater read each question to the patient and scored the response on the 0–5 scale given for each symptom. The interviewers did not have access to the scoring sheet associated with the questionnaire or the patient chart. A chart review was performed by the attending physician 16–17 weeks following the initial visit. All data were confidential without patient identifiers to protect the identity of the patients. At the completion of data collection, the questionnaires were scored and coded based on referral recommendation. All clinicians were blinded to the others' results.

During the 6-month period, the physician had 35 patients qualify for inclusion in the study and 27 patients agreed to participate in the study. Of the 27 patients, 24 were able to be contacted for the collection of demographic data and completion of the SALQ within 24 hours of the initial appointment and were included in the validity study. Of the 24 patients included in the validity study, three were excluded from the inter-rater reliability study due to the inability to be contacted a second time by nursing for repeat administration of the questionnaire.

To determine validity of the SALQ, the methods were duplicated from the previous pilot study.⁷ The presence of a positive reference standard for a diagnosis of visceral pathology or referral to a non-musculoskeletal specialist was the criteria for the presence of non-musculoskeletal pathology. The presence of new fracture or neurological signs and symptoms (loss of bowel and bladder control, saddle area numbness, and multiple level paresthesias with corresponding motor and reflex loss) indicating the need for immediate surgery was the criteria

for emergent musculoskeletal pain. The reference standard for an individual diagnosis was determined by the Joint Clinical Practice Guideline from the American College of Physicians and the American Pain Society.¹⁰ Between 16 and 17 weeks following the initial appointment, the attending physician performed a chart review to collect information on diagnostic testing, follow-up appointments, and referrals made in regard to the complaint of low back pain. The physician's assessment and diagnosis were documented.

After completion of the data collection, a blinded assistant recorded the answers on the score sheet associated with the questionnaire. The score sheet categorizes symptoms individually and in clusters to determine the need for referral. All clinicians remained blind to each other's assessment throughout the study. The data were correspondingly entered by a blinded research assistant.

Statistical tests

The validity of the SALQ was evaluated by its ability to accurately determine the presence or absence of non-musculoskeletal, or emergent musculoskeletal pain, through a sensitivity/specificity analysis. Positive and negative likelihood ratios were also calculated and post-test probability was determined using the prevalence of non-musculoskeletal or emergent musculoskeletal diagnoses found in this study. The inter-rater reliability of the SALQ was determined by performing interclass correlation coefficients (ICCs) for each of the questions using a 95% confidence interval. The ICC was chosen given the narrow ranges of symptoms reported by the patients and the small sample size. A Kappa analysis was performed for the overall scoring determination for referral recommendation. All tests were performed using SPSS 22.0.

Results

Participant characteristics

Eight males and 16 females agreed to participate in the pilot validity study. Six males and 15 females agreed to participation in the inter-rater reliability study. Of these patients, 18 had a history of low back pain and 4 reported previous lumbar surgery. Table 1 contains a summary of the patients' demographic information.

Validity

The performance of the questionnaire by the physical therapist (rater 1) resulted in the recommendation that 13 of the 24 patients be referred to a physician. Descriptive statistics were calculated for the two groups; those that were recommended for referral using the SALQ and those that were not recommended for referral using the SALQ. The SALQ demonstrated a sensitivity of 1.00 (95% CI: 0.689–1.00) and specificity of 0.786 (95% CI: 0.492–0.951) compared to the diagnosis ascribed by the primary care physician. To allow calculation of the negative likelihood ratio, 0.5 was added to each cell. The negative likelihood ratio was 0.059 (95% CI: 0.004–0.902) and the positive likelihood ratio was 4.091 (95% CI: 1.62–10.33). Using the prevalence of individuals presenting with non-musculoskeletal or emergent musculoskeletal back pain found in this study (10/24) and the associated positive and negative likelihood ratios, post-test probabilities were calculated. The pre-test probability is simply the prevalence of the condition in the relevant population. The post-test probability is the prevalence of the condition dependent on the result of the diagnostic test conducted. If the SALQ is positive, the post-test probability is 0.745. If the SALQ is negative, the post-test probability is 0.040. Therefore, if the SALQ recommends referral to an alternate healthcare provider, there is a 74.5% chance that a non-musculoskeletal or emergent musculoskeletal diagnosis is present. If the SALQ does not recommend a referral to an alternate medical provider, there is only a 4% chance that the patient does not have a diagnosis of musculoskeletal pain. Table 2 contains the cross tabulation of results.

Of the 10 patients who demonstrated a recommendation for referral on the SALQ and received a diagnosis of non-musculoskeletal or emergent musculoskeletal pain by their physician, there were nine different diagnoses. Five of the patients had emergent musculoskeletal pain that required surgery within 1 week of the visit. The diagnoses requiring surgery included a new L1 compression fracture with resultant kyphoplasty, two patients with L4/5 disk herniation with emergency decompression surgery, a grade 3 L4/L5 anterior spondylolisthesis with referral for surgical fusion, and a peroneal nerve entrapment with decompression surgery.

Table 1 Patient demographic information

Variable	Referral recommended <i>n</i> =13	Referral Not Recommended <i>n</i> =11
Age (Median)	63.16 (SD: 14.20)	59.00 (SD: 12.75)
Gender (Count)	Male: 3 Female: 10	Male: 5 Female: 6
History of LBP (Count)	Yes: 11 No: 2	Yes: 7 No: 4
History of spinal surgery (Count)	Yes: 2 No: 11	Yes: 2 No: 9
Subjective Health (Count)		
Excellent	0	0
Very Good	4	1
Good	5	8
Fair	4	2
Poor	0	0
Pain rating (scale 0–10)	7.69 (SD: 1.03)	7.00 (SD: 0.93)

SD, standard deviation.

The non-musculoskeletal diagnoses included diverticulitis (with antibiotic treatment initiated), urinary tract infection, hematuria with lymphadenopathy, nephrolithiasis, and an adverse reaction to antirejection medications following liver transplant.

There were three false positive results utilizing the SALQ. One of the patients had a history of B cell lymphoma and had demonstrated the following symptoms related to the recommendation for referral: constant fatigue, daily numbness and tingling in lower extremities inconsistent with a single dermatome, paresthesias in three ipsilateral dermatomes, and inability to sleep without analgesics. The patient's change in sensation and fatigue was attributed to the chemotherapy medication regimen and the patient was referred to neurology for treatment or neuropathy related to chemotherapy. The patient did receive radiographs of the lumbar spine that noted a L3 compression fracture, scoliosis, and L5-S1 anterolisthesis. Each of these had been seen on a previous MRI. Since all of the symptoms that received a score of 3 or higher on the SALQ could be attributed to the patient's past medical history, the results were considered a false positive for requiring a new referral to a physician or physician extender. The second patient was diagnosed with degenerative changes of the lumbar spine and received treatment in a pain clinic for neural ablative therapy in addition to a referral to physical therapy. Diagnostic imaging included lumbar spine and bilateral hip radiographs and right lower extremity venous Doppler. The questions that triggered the recommendation for referral included consistent night sweats, new onset of loss of urinary control with leakage greater than once per week, but not daily, constant sensation of weakness in multiple lower extremity myotomes, and new onset of falls with ambulation. The third patient was diagnosed with non-specific low back pain and was treated with anti-inflammatories and acetaminophen for her symptoms. No diagnostic imaging was performed and her symptoms resolved on follow up. She had reported constant pain that was uncontrolled with analgesics, inability to relieve low back pain with change in position, and constant night time pain preventing sleep. Two of the three false positive patients demonstrated signs and symptoms that resulted in the physician performing multiple diagnostic imaging procedures and laboratory testing with referral to pain specialists.

Inter-rater reliability

Interclass correlation coefficients were performed with a 95% CI for each of the 29 questions in the SALQ. The ICC was chosen to compute inter-rater reliability due to the narrow range of symptoms in the patients and small sample size. Table 3 contains a summary of the ICCs by question. In addition, a Kappa analysis was performed for the agreement between the raters on the recommendation to refer based on the questionnaire scoring guide.

The five questions with an ICC below 0.700 were assessed to determine limitations in the consistency of scores between raters. Three of the above questions are used in the scoring guide to cluster symptoms. Question 2 is related to weight loss and the raters disagreed on five patients. In four of the five patients, the disagreement was between a score of 0 (none) and a score of 1 (if occurred but expected weight loss associated with current diet). However, concerning one patient, the raters demonstrated significant disagreement on weight loss with scores of 0 (none) and 3 (if dieting but losing more weight than expected). In this question, a quantitative measure is not utilized until the score reaches 4, which may have contributed to the discrepancy between raters. Question 7 discusses the presence of the symptom of vomiting. The raters only disagreed on one patient, however, the disagreement was again between 0 (none) and 3 (daily). An explanation for the variance is not available outside of a change in the patients' symptoms during the 24 hours between administrations of the questionnaire. Question 29 addresses paresthesias in the lower extremity. There was a significant variance in the rating of this question with the raters disagreeing on 10 of the patients. This suggests that the terminology and definitions utilized in this question should be modified for better understanding and agreement between raters. Further explanation of what is considered a dermatomal pattern may be necessary in order to improve the rater perception regarding extent of paresthesia present.

Questions 5 and 20 are not used for the clustering of symptoms in the scoring guide, yet provide the physician or physician extender with valuable information when a referral is necessary. Question 5 is a patient rating of compliance with physician appointments and prescribed medications. The raters disagreed on scoring with two patients. Again the difference in scores was between 0

Table 2 Cross-tabulation table (rater 1)

N=24	Medical diagnosis or emergent musculoskeletal diagnosis	Non-specific musculoskeletal low back pain
+SALQ	10 (True - positive)	3 (False - positive)
-SALQ	0 (False - negative)	11 (True - negative)
	Sensitivity=TP/(TP+FN)	Specificity=TN/(TN+FP)
	Sensitivity=10/10	Specificity=10/14
	Sensitivity=1.00 (95% CI: 0.689–1.00)	Specificity=0.786 (95% CI: 0.492–0.951)
	*+LR=sensitivity/(1-specificity)	*-LR=(1-sensitivity)/specificity
	*+LR=4.091 (95% CI: 1.62–10.33)	*-LR=0.059 (95% CI: 0.004–0.902)

*0.5 was added to each cell to calculate likelihood ratios.

and 1 with one patient indicating a low level response to both raters that was below the threshold of 3 for presence of the symptom. There was a substantial difference on the other patient with the raters scoring 0 (none) and 3 (if compliant with 25% but <75% of meds or F/U visits). This difference may be attributed to patient response, as one of the raters was a nurse in the attending physician's office. The patient may have altered the response to meet the expectation of the nurse regarding compliance. Question 20 inquires about new skin morphology in the last year. There was a disagreement on four patients. Three of those disagreements were between 1 and 2. The variance was impacted by a difference in rating on one patient between 0 and 3 (if up to three morphology changes that are known for >1 year or two new morphology changes within last year). The description of the morphology (telangiectasia, subcutaneous nodule, malar rash, or discoid rash) by the raters may have impacted the response.

Overall, regarding the recommendation for referral, the physical therapist and nurse demonstrated agreement on 20 of the 21 patients with a Kappa of 0.798. Concerning the patient in which the raters disagreed in the scoring for referral need, the raters disagreed on question 23 regarding inability to sleep related to pain. The difference in scores was between 4 (if having pain but able to sleep with analgesic medications) and 5 (if problems in sleeping due to pain and analgesics do not improve situation) resulting in need for referral. This patient did have lumbar spine radiographs demonstrating a new L1 compression fracture compared to radiographs performed 2 weeks previously. The patient was referred for a kyphoplasty.

Discussion

The alteration in the phrasing of the questions in the SALQ did not appear to substantially impact the validity of the questionnaire. The negative likelihood ratio in the current study was 0.059 (95% CI: 0.004–0.902) and the positive likelihood ratio was 4.091 (95% CI: 1.62–10.33). This is compared to a negative likelihood ratio of 0.11 (95% CI=0.01, 1.54) and a positive likelihood ratio of 9.36 (95%

CI=2.78, 32) found in the previous pilot study.⁷ The negative likelihood ratio was stronger in the current study suggesting that the SALQ may be utilized as a screening tool.

The study did demonstrate a high pre-test probability of the presence of non-musculoskeletal or emergent musculoskeletal pain at 41.6%. The pre-test probability may have been impacted by the increased complexity of patients seen by the internal medicine physician participating in the study. This complexity may have contributed to a higher risk of non-musculoskeletal and emergent musculoskeletal pain. The previous pilot study utilized both a board certified internal medicine and a family care physician with a lower incidence of non-musculoskeletal pain of 14%.⁷ The relatively large prevalence of non-musculoskeletal and emergent musculoskeletal pain found in both studies emphasizes the need for a thorough medical screening process as physical therapists become more autonomous in practice.

The test re-test reliability of the individual items on the SALQ was high for 24 of the 29 questions. The three questions with fair test–retest reliability that are utilized in the clustering of symptoms for scoring of the questionnaire should be examined for alterations in the definitions and phrasing of the questions for improved consistency between raters. These questions were numbers 2, 7, and 29. Question 2 is related to weight loss. An explanation of how much weight loss is typically expected with dieting may be necessary to improve understanding of the Likert scale. The discrepancy in scoring number 7 (vomiting) may be related to a change in the patient's symptoms over 24 hours. However, this question should continue to be assessed in future studies. Finally, additional descriptions regarding the interpretation of a dermatomal pattern may be required for question 29. The overall test–retest reliability for referral recommendation was high, which indicates that the tool demonstrates limited measurement error between test applications.

Limitations of the study include the small sample size resulting in large CIs for sensitivity and specificity. Furthermore, although the physician, physical therapist,

Table 3 Inter-rater reliability of the individual questions on the SALQ

Question	ICC (CI 95%)	Sig	Question	ICC (CI 95%)	Sig
1	0.792 (0.494–0.915)	0.000	16	0.937 (0.847–0.974)	0.000
2	0.633 (0.073–0.852)	0.017	17	0.997 (0.993–0.999)	0.000
3	0.844 (0.613–0.937)	0.000	18	0.930 (0.828–0.971)	0.000
4	0.769 (0.420–0.907)	0.001	19	0.965 (0.914–0.986)	0.000
5	–0.064 (–1.753–0.577)	0.533	20	0.648 (0.171–0.854)	0.007
6	0.957 (0.896–0.983)	0.000	21	0.901 (0.708–0.963)	0.000
7	0.274 (–0.775–0.705)	0.240	22	0.930 (0.828–0.971)	0.000
8	0.903 (0.795–0.960)	0.000	23	0.905 (0.843–0.979)	0.000
9	1.00	–	24	0.945 (0.843–0.979)	0.000
10	1.00	–	25	0.963 (0.909–0.985)	0.000
11	0.840 (0.652–0.964)	0.000	26	0.978 (0.947–0.991)	0.000
12	0.992 (0.981–0.997)	0.000	27	0.902 (0.758–0.960)	0.000
13	0.931 (0.832–0.972)	0.000	28	0.985 (0.962–0.994)	0.000
14	0.980 (0.951–0.992)	0.000	29	0.583 (0.043–0.826)	0.016
15	1.00	–			

and nurse were blinded to the information gathered in the history and SALQ, overlap in information gathered most probably occurred. This would result in similar questions or information being used by both the physician and the physician extender as a basis for determining the presence of a non-musculoskeletal condition. This is a threat to internal validity of the study.

Conclusion

The SALQ may serve as an alternative to the use of red flags, in isolation, to assist the physical therapist in determining the need for medical referral as the profession continues to progress toward direct access. The outcome of this study would support consideration of the SALQ as a viable clinical instrument for the future. Additional studies on a larger scale that would be more representative of the population seeking care for new onset low back pain must be performed to further validate the questionnaire and the value of these findings.

Disclaimer Statements

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Conflicts of interest The author of this manuscript assisted with the development of the ScreenAssist Lumbar Questionnaire.

Ethics approval The research proposal was approved by the University of Evansville's Internal Review Board.

References

- 1 Sizer P Jr., Brismee J, Cook C. Medical screening for red flags in the diagnosis and management of musculoskeletal spine pain. *Pain Pract.* 2007;7:53–71.
- 2 Boissonnault WG. Examination in physical therapy practice screening for medical disease. New York: Churchill Livingstone; 1991. 1.
- 3 Goodman CC, Fuller KS, Boissonnault WG. Pathology implications for the physical therapist, 2nd edn. Philadelphia, PA: Saunders; 2003.
- 4 Goodman CC, Snyder TE. Differential diagnosis in physical therapy, 3rd edn. Philadelphia, PA: WB Saunders; 2000.
- 5 Henschke N, Maher CG, Refshauge KM, Herbert RD, Cumming RG, Bleasel J, et al. Prevalence of and screening for serious spinal pathology in patients presenting to primary care settings with acute low back pain. *Arthritis Rheum.* 2009;60:3072–80.
- 6 Meadows J. Orthopedic differential diagnosis in physical therapy. New York: McGraw-Hill; 1999.
- 7 Cunningham S. Diagnostic accuracy: sensitivity and specificity of the ScreenAssist lumbar questionnaire in comparison with primary care provider tests and measures of low back pain: a pilot study. *J Man Manip Ther.* 2013;21(1):48–59.
- 8 Deyo RA, Rainville J, Kent DL. What can history and physical examination tell us about low back pain? *JAMA.* 1992;268:760–5.
- 9 Donato EB, DuVall RE, Godges JJ, Zimmerman GJ, Greathouse DG. Practice analysis: defining the clinical practice of primary contact physical therapy. *J Orthop Sports Phys Ther.* 2004;34:284–304.
- 10 Chou R, Qaseem A, Snow V, Casey D, Cross JT Jr., Shekelle P, et al. Clinical efficacy assessment subcommittee of the American college of physicians, American college of physicians, American pain society low back pain guidelines panel. Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American college of physicians and the American Pain Society. *Ann Med Intern.* 2007;147:478–91.

Appendix A

ScreenAssist Lumbar Spine Questionnaire

1. **Constitutional** In the last 2 weeks have you experienced a **Fever**?
0 if none
1 if felt warm but never took temp
2 if recorded a Temp: above normal but <99.5
3 if recorded a Temp: 99.5 but <101
4 if recorded a Temp: 101 but <103
5 if recorded a Temp: 103 or higher
2. **Constitutional** In the last 3 months have you demonstrated **Weight loss**?
0 if none
1 if occurred but expected weight loss associated with current diet
2 if not dieting but losing between 0 to 2% body weight per week
3 if dieting but losing more weight than expected
4 if losing >2% but ≤4% body weight per week irrespective of diet
5 if losing >4% body weight per week irrespective of diet
3. **Constitutional** In the last 2 weeks have you experienced **Night sweats**?
0 if none
1 if once in last 10 nights
2 if >once in last 10 nights but ≤every three nights
3 if >once every three nights but ≤once a night
4 if every night but no change in bedclothes needed
5 if every night & changing bedclothes needed
4. **Constitutional** In the last 4 weeks have you experienced increased **Fatigue**?
0 if none
1 occurs but well explained by lack of sleep or vigorous exercise
2 spontaneously occurs but ≤two times a week
3 if occurs two or more times a week but <daily
4 if complains of fatigue daily, but not all day long
5 if constant fatigue
5. **Constitutional** Over the last year have you been compliant with physician recommendations? **Medical compliance self-assessment**
0 if always taking meds and never missing follow up (F/U) appointments
1 if takes meds & keeps F/U visits but does not feel they are necessary
2 if compliant with 75% but <100% of meds or F/U visits
3 if compliant with 25% but <75% of meds or F/U visits
4 if compliant with <25% of meds or F/U visits but does not refuse either
5 if refuses medications and medical F/U visits
6. **Endocrine** Have you ever been diagnosed with **Diabetes mellitus**?
0 if not diabetic
1 if not diabetic but a sibling or parent is
2 controlled (fasting BS<150 mg/dl or last HA1C<7.5%) & on no medicines for glucose control
3 controlled (fasting BS<150 mg/dl or last HA1C<7.5%) but on medication for glucose control
4 if keeps F/U visits but fasting BS between 150 to 250 (mg/dl) often or last HA1C between 7.5 to 9.5 (%)
5 if fasting BS > 250 mg/dl or not checking finger sticks or HA1C>9.5% or no DM F/U visits
7. **Gastrointestinal** Over the last month have you experienced **Vomiting**?
0 if none

- 1 if vomiting once every 5 days
- 2 if vomiting not daily but < every 5 days
- 3 if vomiting daily but ≤ 3 times a day
- 4 if vomiting > 3 times a day but not constantly vomiting
- 5 if constantly vomiting
8. *Gastrointestinal* In the last 3 months have you experienced **Heartburn**?
 - 0 if none * *Note: NSAIDs stands for Non- Steroidal Anti Inflammatory Drugs (Ibuprofen, aspirin-like meds)*
 - 1 if having heartburn < 15 minutes a week & not on NSAIDs & not on meds for heartburn
 - 2 if heartburn occurs ≥ 15 minutes/week but < daily & not on NSAIDs & not on meds for heartburn
 - 3 if not on meds for heartburn plus it started after using NSAIDs or if not on NSAIDs, daily but not constant
 - 4 if taking meds to treat heartburn which may be controlled or refractory but not constant heartburn
 - 5 if constant heartburn with or without meds
9. *Gastrointestinal* Over the last 4 weeks has there been a change in **Stool color**?
 - 0 if never had black nor bloody stools
 - 1 if black or bloody stool once in last month
 - 2 if black or bloody stools but occurring > once a month but < once a week
 - 3 if black or bloody stools but occurring $\geq$ once a week but < every 2 days
 - 4 if black or bloody stools but occurring every 2 days or more frequently but not 5 days in a row
 - 5 if black or bloody stools for 5 days in a row or more
10. *Gastrointestinal* Over the last 4 weeks has there been a change in **Stool volume**?
 - 0 if no change from baseline or actually decreased
 - 1 if client feels > baseline but < 50% increase
 - 2 if client feels 50% to < 100% more than baseline
 - 3 if client feels 100% to < 200% more than baseline
 - 4 if client feels 200% or higher but fully continent
 - 5 if so excessive afraid of continence or if had incontinence
11. *Gastrointestinal* Over the last 4 weeks has there been a change in **Stool consistency**?
 - 0 if unchanged stools or well formed
 - 1 if one loose stool but occurred over 7 days ago
 - 2 if one loose stool > 2 days ago but < 7 days ago
 - 3 if just one loose stool ≤ 2 days ago
 - 4 if daily loose stool but $\leq$ three loose stools per day
 - 5 if > three loose stools per day
12. *Gastrointestinal* Over the last 3 months has there been a change in **Control of bowels**?
 - 0 if complete control or longstanding continence problems proven benign by a workup
 - 1 if new rectal leakage occurs but not more than once a month
 - 2 if new rectal leakage occurs > once a month but $\leq$ once a week
 - 3 if new rectal leakage occurs > once a week but not daily
 - 4 if daily new rectal leakage but can wear same underwear throughout day
 - 5 if daily new rectal leakage & change of underwear needed or protective padding used
13. *Gastrointestinal* Over the last 3 months have you experienced **Constipation**?
 - 0 if none or unchanged bowel habits
 - 1 if felt constipated but not more than once a month
 - 2 if felt constipated > once a month but $\leq$ once a week
 - 3 if felt constipated > once a week but not daily
 - 4 if feeling constipated daily but not taking meds for a bowel movement
 - 5 if feeling constipated daily & needs meds for a bowel movement
14. *Genitourinary* Over the last 3 months have you experienced **Blood in urine**?
 - 0 if none
 - 1 if noted but not more than once a month
 - 2 if noted > once a month but $\leq$ once a week
 - 3 if noted > once a week but not daily
 - 4 if noted daily but not constantly
 - 5 if noted with every void
15. *Genitourinary* Over the last 3 months have you experienced a change in **Control of urine**?
 - 0 if complete control or longstanding continence problems proven benign by a workup
 - 1 if new episodes of loss of control but not more than once a month
 - 2 if new episodes of loss of control > once a month but $\leq$ once a week
 - 3 if new episodes of loss of control > once a week but not daily
 - 4 if daily new episodes of loss of control but can wear same underwear throughout day
 - 5 if daily new episodes of loss of control & change of underwear needed or protective padding used
16. *Genitourinary* Over the last 3 months have you experienced a change in **Urinary frequency**?
 - 0 if no change from baseline
 - 1 if increased frequency occurred but not more than once a month
 - 2 if increased frequency occurs > once a month but $\leq$ once a week
 - 3 if increased frequency occurs > once a week but not daily
 - 4 if increased frequency occurs daily but not constantly
 - 5 if increased frequency occurs constantly throughout the day
17. *Neurologic* Over the last 4 weeks have you experienced numbness or loss of feeling in your legs? **Frequency of lower extremity change in sensation**

Note: Question refers to entire Lower extremity versus single dermatome

 - 0 if none * *Note: Score 0 if due to previously evaluated stroke or injury and unchanged since that event*
 - 1 if sensation change < 10 minutes over last month
 - 2 if sensation change ≥ 10 minutes over last month but < 15 minutes a week
 - 3 if sensation change ≥ 15 minutes a week but not daily
 - 4 if sensation change daily but not constant
 - 5 if constant sensation change
18. *Neurologic* Over the last 4 weeks have you experienced weakness in your legs? **Frequency of lower extremity weakness**

Note: Question refers to entire Lower extremity versus single myotome

 - 0 if none * *Note: Score 0 if due to previously evaluated stroke or injury and unchanged since that event*
 - 1 if weakness occurred < 10 minutes over last month
 - 2 if weakness occurred ≥ 10 minutes over last month but < 15 minutes a week
 - 3 if weakness occurred ≥ 15 minutes a week but not daily
 - 4 if weakness occurs daily but not constant
 - 5 if constant sensation of weakness
19. *Neurologic* If you have had weakness in your legs over the last month does it change your ability to function? **Extent of lower extremity weakness**
 - 0 if none * *Note: Score 0 if due to previously evaluated stroke or injury and unchanged since that event*

- 1 if seems weak but no loss of function
- 2 if noticing weakness while walking (stopping or shorter distances) but can walk without falling
- 3 if noticing weakness will fall while walking or relying on wheelchair or other assisted mobility
- 4 if able to move legs but cannot walk nor go from seated to standing
- 5 if unable to move lower extremity
20. *Rheumatological* In the last year have you noticed any rashes or skin conditions? **Skin morphology**
 - 0 if none * *Note: Morphology change implies telangiectasia, subcutaneous nodule, malar rash or discoid rash*
 - 1 if only 1 instance of morphology change & known for > 1 year
 - 2 if only 1 instance of morphology change but started within last year
 - 3 if up to 3 morphology changes that are known for > 1 year or 2 new morphology changes within last year
 - 4 if 4 morphology changes, known for > 1 year or 3 new morphology changes within last year
 - 5 if all 4 morphology changes that are new within last year
21. *Hematological* Over the last year have you had a history of **Immune suppression**?
 - 0 if none * *Note: Systemic steroids include Prednisone, Solumedrol, Kenalog, Depomedrol*
 - 1 currently not immunosuppressed, but will take systemic steroids for ≤ 1 week ≤ 2 times a year
 - 2 currently not immunosuppressed but receives systemic steroids > 2 times a year
 - 3 currently on systemic steroids or other immunosuppressants, but no transplant history & HIV negative
 - 4 HIV positive or transplant history
 - 5 known very low white blood cell count (WBC count < 2) due to medical therapy or illness
22. *Lumbosacral* Over the last 2 weeks have you experienced low back pain during the day? **Lumbosacral daytime pain**
 - 0 if none * *Note: Responses 1–3 assume no analgesic medications are used*
 - 1 if pain noted but none for >1 week
 - 2 if pain occurred ≤ 1 week ago but lasts < 1/2 of the day
 - 3 if pain occurred ≤ 1 week ago but lasts $\geq 1/2$ of the day will resolve without analgesics
 - 4 if constant pain but resolves with analgesics
 - 5 constant pain, uncontrolled with analgesics
23. *Lumbosacral* Over the last 2 weeks have you experienced low back pain making it difficult to sleep? **Lumbosacral night time pain**
 - 0 if none * *Note: Responses 1–3 assume no analgesic medications are used*
 - 1 able to sleep entire night once a comfortable position is found
 - 2 pain awakens due to positional change, but able to fall back asleep
 - 3 awaken often without attributing to positional change, can fall back asleep
 - 4 if having pain but able to sleep with analgesic medications
 - 5 if problems sleeping due to pain and analgesics do not improve situation
24. *Lumbosacral* Over the last week has the pain ever gone into your buttock or leg? **Lumbosacral extent of pain referral**
 - 0 if no lumbosacral pain
 - 1 if lumbosacral pain, never referred
 - 2 pain refers away from back but < one instance a week
 - 3 pain refers away from back $\geq$ once a week but not daily
 - 4 if pain refers away from back daily but can resolve with positional change
 - 5 if pain refers away from back daily and cannot resolve with positional change
25. *Lumbosacral* Is your pain sharp or dull? Do medications help with the pain? **Lumbosacral quality of pain**
 - 0 if none
 - 1 if dull & no analgesics needed
 - 2 if dull & analgesics are used for relief
 - 3 if sharp & no analgesics are used
 - 4 if sharp & analgesics are used for relief
 - 5 if uncontrolled with analgesics, either dull or sharp
26. *Lumbosacral* Can you get into a position that relieves or lessens your pain? **Lumbosacral pain relieving factors**
 - 0 if no lumbosacral pain
 - 1 if stopping aggravating activity relieves pain
 - 2 must sit to relieve the pain
 - 3 only laying down relieves pain
 - 4 must sit & forward flex to relieve pain
 - 5 unable to relieve pain with change in position
27. *Lumbosacral* Are there activities or positions that increase your low back pain? **Lumbosacral pain precipitating factors**
 - 0 if no lumbosacral pain
 - 1 if worse only after clearly overusing back
 - 2 if worse after activities which used to be tolerable
 - 3 if worse after standing or walking but not immediately
 - 4 if worse simply upon standing or walking, or worse after laying down
 - 5 constant uncomfortable pain
28. *Lumbosacral* Can you recall an activity that initiated your low back pain? **Lumbosacral trauma**
 - 0 if no lumbosacral pain * *Note: Known incident means a recalled activity leading to the pain*
 - 1 gradual onset of pain without known incident
 - 2 if after known incident and client felt medical care was not necessary and no medical evaluation performed
 - 3 if after known incident and client sought medical care > 24 hours after known incident
 - 4 if after known incident and client sought medical care ≤ 24 hours after known incident
 - 5 if no trauma or precipitating event but sudden onset severe pain
29. *Lumbosacral* Have you had any tingling, itching, or burning sensations in your back or legs? **Lumbosacral paresthesia**
 - 0 if no lumbosacral paresthesia
 - 1 if localized to area of pain
 - 2 if paresthetic in only one dermatome
 - 3 if paresthetic to two ipsilateral dermatomes
 - 4 if paresthetic in three ipsilateral dermatomes
 - 5 if contralateral lower extremity or bilateral lower extremity paresthesia

To assist with use of the questionnaire, the following scoring guide is given. These are recommendations only. Therapists need to use clinical experience and professional judgment when deciding the need for referral. The ability and timeframe to contact and discuss clients with physicians may also impact the therapist's referral pattern. In addition, depending on the clients past medical history, some symptoms may be an expected result of known pathology that is currently being managed according to the standard of care

If the individual scored 5 on any of the following questions, consider transfer to emergency medical care:

1 3 7 9 12 14 15 16 19 23 28

If the individual scores 5 on two or more of the following questions, consider referral to a physician or alternate primary care provider immediately, urgent care or to emergency care:

8 10 22 24 25 26 27 29

If the individual scores 3 or higher on three of the questions, consider referral to a physician or alternate primary health-care provider for consult within 48 hours:

1 2 3 4 7 8 9 10 11 12 13 14 15 16 17 18 19 23 29