RELATIONSHIP BETWEEN LUMBAR RANGE OF MOTION AND PATIENTS' DISABILITY STATUS

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ABSTRACT

The purpose of this study was to determine any association between lumbar range of motion (ROM) and a disability questionnaire in patients with low back pain. The data were obtained from twenty charts of 12 male and 8 female adults, ages 20 to 50 years old, who had physical therapy treatment due to low back pain. The patients completed a Roland Scale questionnaire and the BROM instrument was used to measure frontal and sagittal plane ROM of the lumbar spine. The Pearson Correlation Coefficient between flexion and the Roland Scale was -0.19; extension and the Roland Scale, r=-0.22; and lateral flexion and the Roland Scale, r=-0.31. The data analysis using the standard multiple regression showed that R^2=.018 and an adjusted R^2=.023, with no significance at the .05 level (p=.36). The results of this study showed no significant correlations between lumbar ROM and the Roland Scale.

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CHAPTER I

INTRODUCTION

Nature of the Study

Low back pain (LBP) is a very common condition in today's world. LBP is caused by different sources and varies in its clinical symptomology.[1,2,3] The pain can be acute or can become chronic.[1] The perception of pain varies among patients and it is very subjective. Many scales have been developed to try to make pain an objective measurement and to better understand the patient's perception of pain. On the other hand, pain can affect the patient's activities of daily living by making the activities intolerable or lowering the quality or endurance of their performance.[4] Therefore, other scales have been used to determine how pain can affect the patient's performance.[1] Among these scales is the Roland Scale[3] or Disability Questionnaire. This scale was developed as a simple method of measuring disability in patients with back pain.[4] Patients with LBP can be affected in a physical manner as well as psychologically.[1]

Patients with LBP usually present some kind of impairment or may become disabled.[1,2,3,4,5] Disability is defined as the limiting loss or absence of the capacity of an individual to meet personal, social, or occupational demands, or to meet statutory or regulatory requirements.[5] This is differentiated from impairment which is the loss of, loss of use of, or derangement of any body part,

system, or function.[5] When assessing a patient with low back pain, the physical therapist takes into consideration a collection of objective data and functional assessment. Functional assessment is usually done by asking the patient to name the activities he or she cannot do or has difficulty in doing due to the pain. According to the evaluation, the physical therapist will establish the plan of care and goals to reduce pain and improve the patient's functional status.

Besides pain, the patient can exhibit other affectations related to low back problems. Some studies have shown decreased lumbar range of motion (ROM) in patients with LBP. [6,7,8] Lumbar ROM is assessed by the physical therapist as part of the evaluation, and the goal is to increase motion, resulting in improved patient function. Different methods have been developed to assess lumbar spine mobility. Such methods include serial radiography, goniometry, fingertips to floor gauge, modified Schober method, tape measure and isokinetic machine. Another instrument that has been incorporated in measuring lumbar ROM is the Back Range of Motion (BROM) instrument. This instrument has been demonstrated to have a high intratester reliability with an r value of 0.86.[9]

Statement of the Problem

Studies have shown decreased lumbar ROM in patients having low back pain, especially forward flexion.[6,7,8] Some functional scales and pain scales have been used to determine LBP patients' perception of disability,[1,3] but results of these subjective reports have not been correlated with objective

measures such as range of motion.

Review of Related Literature

Dealing with LBP is very difficult primarily due to the lack of any definite diagnosis.[1,2,3,10] Sources of LBP are numerous. Almost all of the structures and tissue of the lumbar spine are innervated and are susceptible to some form of disease or injury that could become a source of pain.[1,2,3,10] Pain can be aggravated by sitting or any activity requiring bending in patients that have discogenic pain, but sitting can relieve pain in patients that have spondylolisthesis.[1] Gravitational compression during sitting and standing is a main factor for chronic pain. Patients with the same diagnosis may be affected with widely varying degrees of pain. The psychological aspect of LBP has to be considered. It is difficult to establish a borderline between the psychological and physiological components in patients with LBP. Patients with psychogenic pain will have little or no relief from LBP. If it is difficult to understand LBP, then it is more difficult to diagnose patients with psychogenic LBP. Different attempts have been made to classify LBP as it is correlated to a specific diagnosis according to certain common signs and symptomology, but this has been very difficult to do. A better understanding has to be developed in classifying LBP, so that a better treatment can be accomplished.[1,2,3]

Patients having LBP present with restriction in lumbar spine flexibility. In a study done by Adeyemi,[6] she concluded that patients with LBP have restriction in lumbar flexion. This was also confirmed by Mayer et al.[11] Age is also a

factor in changing spinal mobility. Fitzgerald et al[12] found decreased lumbar ROM into anterior flexion, extension and lateral flexion, particularly in patients over sixty years old.

The measurements of the lumbar spine ROM described above are measurements of impairment. Impairment may lead to disability, but the American Medical Association guidelines says "not to make a one-to-one translation of impairment to disability".[5] A patient can have decreased lumbar ROM but be able to perform the activities of daily living functionally. Different scales are used to measure disability in different conditions. Some of these scales are used to measure a broad aspect of different functional activities, while other ones have been developed specifically for patients with low back pain. Many of these scales are research tools that are not suitable for clinical use.

Justification and Purpose

Impairment of the lumbar ROM is not enough to establish any goal to treat a patient with LBP. The disability status is very important to establish functional goals. The patient feels disabled when there is a loss of physical functions and activities he or she was able to perform prior to low back pain. Causes of LBP vary but the patient's functional performance can be affected similarly. More research studies are needed to continue to establish if there is any relation between restriction in lumbar ROM and patient's disability status.

The purpose of this study is to determine if there is any association between

lumbar ROM (flexion, extension and lateral flexion) and a disability questionnaire (Roland Scale) in patients with low back pain. The expected result is that lumbar ROM will correlate highly with the Roland Scale.

CHAPTER II

REVIEW OF LITERATURE

Lumbar range of motion is measured in LBP patients as part of the physician's impairment rating. According to the American Medical Association guidelines, the lumbar spine is measured in flexion, extension and lateral flexion.[5] The tools they utilize to measure lumbar spine flexibility are the two-inclinometer method and the single inclinometer method.[5] These guidelines do not take into consideration age as a factor in having decreased ROM in patients over sixty years old. Also, the guidelines established are to obtain patient's maximal ROM without being specific about painfree or pain tolerated ROM.

Among the different methods and equipment used to assess lumbar spine ROM, radiography has been the most accurate but it is expensive and an invasive procedure.[1] The goniometer is generally used in physical therapy but has been found to have a low repeatability. Gill et al[13] did a study utilizing four different techniques and tools to measure lumbar spine flexion. They compared the Schober method, finger-to-floor technique, two-inclinometer technique and photometric technique. The results of this study showed that the Schober technique was the most repeatable technique. On the other hand, another study showed this technique to have low repeatability.[14] Rondinelli et al[9] concluded that the intrarater reliability was high for the back ROM instrument and single inclinometer, but was moderate for the double inclinometer method.

Chiarello and Savige[15] stated that the fluid inclinometer was very reliable to measure lumbar ROM in all positions in patients with low back pain.

Little is found in the literature about the BROM instrument. This is a relatively new instrument which has been incorporated as part of the evaluation of lumbar spine flexibility in some physical therapy clinical settings. This instrument is a combination of a fluid inclinometer and goniometer which can measure lumbar spine ROM. One of the advantages of using the BROM instrument is that the repositioning error is eliminated during flexion and extension of the lumbar spine; therefore, the BROM instrument is thought to be more accurate for the measurement of total sagittal plane ROM. The literature presents a study done by Rondinelli et al[9] in 1992. The purpose of the study was to determine the magnitude and clinical significance of surface measurement error in determining lumbar flexion. The authors selected two observers to take measurement of lumbar flexion using four methods: single inclinometry, double inclinometry, BROM instrument, and B-200. They utilized 8 healthy subjects 18 to 30 years old. Three replicate sets of measurement of the lumbar flexion were obtained. The inter-rater reliability of the BROM instrument was 0.77; the double inclinometer was 0.69; and of the single inclinometer was 0.76. The intrarater reliability of the BROM instrument for observer 1 was 0.81; and 0.91 for observer 2. Intermethod reliability as determined by Interclass Correlation Coefficients between single inclinometer versus BROM instrument (ICC=0.75) was unacceptable by the authors. The authors concluded that both the BROM instrument and single inclinometry method had a high intrarater reliability.

Pain assessment is used in physical therapy to establish pain level in the evaluation and during the course of treatment. The verbal scale, the visual analogue scale and the McGill-Melzack pain questionnaire are some of the methods used to determine the patient's own understanding of pain level.[16] These scales help to understand the intensity and description of the pain patients are having, but they do not say anything about dysfunction due to pain.

Functional scales are also part of the assessment of patients with low back pain. This is still a subjective measurement since it is observed by the patient's own perception of disability. Many scales have been used with different purposes. The Oswestry Disability Index which includes 10 questions with forced choice of one of six options was developed specifically for LBP patients.[1] This scale has internal consistency and test-retest reliability but only measures the severity of the different activities covered. The Chronic Illness Problem Inventory (CIPI) is another approach to the assessment of physical and psychosocial functioning in chronically ill people. The validity of this scale has not been adequately established. Romano et al[17] did a study to compare the Chronic Illness Problem Inventory (CIPI) and the SIP as a measure of dysfunction in chronic low back pain sufferers. The researchers had 95 subjects in pretreatment session and 75 subjects post-treatment. Subjects filled out each questionnaire. The results showed a instrument correlation of r=0.72 in pretreatment and r=0.62 in post-treatment. The authors concluded that this study provided preliminary support for the utility of the CIPI, but its validity has to be established. The Sickness Impact Profile (SIP) is a well documented scale which has been used to assess physical and psychological dysfunction.

The SIP is a 136-item measure which has been used in different conditions. There are many studies done demonstrating that the SIP has a good reliability and validity. Due to the length of this scale, it is not always practical to use in busy clinical settings. Roland and Morris[4] developed a short version of the SIP in 1982. This scale has 24 items and the patient has to check off the ones describing his condition. The authors suggested that this scale is more sensitive to measure the results of treatment than a pain scale. The validity of this scale has been demonstrated and can be used easily in a clinical setting due to the short method. Deyo and Deihl[18] demonstrated the reliability and validity of the SIP with low back pain patients. They had 80 subjects who entered the study, and 63 of them returned for a follow-up evaluation. The test retest reliability was high (r=0.85) according to a Pearson Correlation for six subjects whose condition was rated unchanged by themselves and a clinician. The validity was a high measure for both physical and psychological functions of the SIP as they were compared to the biologic and psychosocial information gathered from patients by investigator.

Jensen et al[19] examined the reliability and validity of the Roland Scale as a measure of dysfunction among chronic pain patients. They utilized 144 subjects, who were screened for admission to an inpatient pain management program. The SIP was administered to the subjects. One hundred sixteen of the patients were admitted to the inpatient treatment and the SIP was readministered. At 3-months post-treatment, 52 subjects answered the SIP again. The primary pain areas of these subjects varied, such as low back, neck, shoulder and arm, head, thoracic and other areas. The results showed

that the reliability of the Roland Scale calculated by test-retest stability coefficient for each scale from screening to admission was r=0.72 for back patients and r=0.65 for patients with other diagnoses. The correlation of the SIP Roland and the validity were established by showing a very high correlation (0.82 - 0.91 between the SIP Roland and other areas of the SIP). The authors concluded that this study supported the reliability and validity of the SIP Roland Scale as a measure of the physical dysfunction in chronic pain patients.

Deyo[20] did another study of the Roland Scale with LBP subjects. SIP was administered to each patient and the 24 items compressing the Roland scale were examined separately. All patients were scheduled for three weeks follow-up visit and the SIP was readministered. The test retest reliability among patients with no clinically related changes and Roland Scale showed a correlation of 0.80. The correlation among those who had not resumed full activities was moderately high, but the Roland Scale showed the best correlation (r=0.76). The author proposed that the validity was well established due to its high correlation with the SIP Physical Dimension.

CHAPTER III

METHOD AND PROCEDURE

Subjects

Data for this research project were obtained from the charts of the Physical Therapy Department at Katy Medical Center, Katy, Texas, and was approved by the Director of the Physical Therapy Department (See Appendix A). The charts of twenty subjects, 12 male and 8 female adults, from age 22 to 50 years old who received physical therapy were used for this study. The subjects were referred to physical therapy by their physicians for treatment due to low back pain. Charts on subjects with previous back surgery and structural scoliosis were excluded from this study.

Equipment

A typed Roland Scale questionnaire (See Appendix B) and red ink pen were given to each subject. The scale has 24 sentences and each one has a value of one point with a maximum of 24 points. The score can vary from zero (no disability) to 24 (severe disability). The repeatability of this questionnaire was found to be high.[3] The questionnaire also has instructions on how to complete the scale.

The Back Range of Motion Instrument was used to measure frontal and

sagittal planes of lumbar spinal movement. The flexion/extension unit includes the base, protractor and sliding arm. The base has two vertical contact points 1 7/8 inches apart that are placed on the sacral spine. The base wings provide contact and allow the tester to maintain pressure evenly on the sacrum, minimizing rocking movement. The base wings are placed on the subject's ilia. The protractor pivots on the base with a bubble vial that should be centered for pelvic tilt measurements. The pointer on the base indicates flexion and extension angles on the protractor degree scale. The sliding arm inserts into the protractor slide opening. It has a long and short end. The short end of the slide arm has a line to indicate proper positioning on the upper vertebra to be measured. The long end has lines that indicate the distance between the upper measurement point and the sacrum.

The lateral flexion unit uses a positioning frame with an inclinometer. The positioning frame has two slip-resistant feet which are 5 3/4 inches apart and they rest against patient's back. The inclinometer is mounted in a vertical plane for measuring lateral flexion.

Procedure

The following normal evaluation procedures was carried out as part of routine physical therapy treatment.

Subjects sat in a chair and will completed the questionnaire. Completion of the Roland Scale questionnaire took 5 minutes or less. After finishing the questionnaire, they were asked to put on a gown. The method for measuring

lumbar flexion, extension, and lateral flexion will be followed according to the BROM instrument procedure book. The landmarks of S_1 and T_{12} were marked on each subject using a washable marker.

Flexion and Extension:

The therapist instructed the subject to stand straight with feet approximately shoulder width apart and hands hanging loosely at the side. The therapist demonstrated the flexion and extension movements. The subject practiced these movements once. The therapist palpated T_{12} and S_1 and marked these points with the washable marker. The therapist stood at the subject's right side holding the flexion/extension unit of the BROM instrument in the left hand with the upper contact (pivot) point positioned over the S_1 already marked on the patient. The therapist's left index finger and thumb was placed on each wing resting the heel of the hand on the subject for stability. He maintained constant pressure on the base with the left hand, while using his right hand to insert the proper slide arm into the pocket. The tip of the slide arm was placed over the upper measurement point which will be T_{12}. A line on the long end of the arm indicated the distance between S_1 and T_{12}. The number was read and recorded. The subject was instructed to flex slowly into the maximum flexion position within the pain tolerance limits. The tip of the slide arm was repositioned on the upper point of contact if needed. At this time, the reading was taken again. The difference between the initial and the second reading was the true flexion motion of the lumbar spine. The subject was asked to assume the initial position and the therapist checked that the reading of the

outside degree scale is the same as the initial reading. If these readings did not match, the measurement was done again. Then the subject was instructed to move slowly into maximum extension within the pain tolerance limits. The tip of the slide arm was repositioned if needed and the reading taken. The true extension motion was the difference between the initial and the second reading. The subject was instructed again to return slowly to the initial position. The reading of the outside degree scale should be the same as the initial reading.

Lateral Flexion:

The subject was instructed to stand straight with feet approximately shoulder width apart with hands hanging loosely at the subject's side. The subject was asked to look straight forward. The therapist demonstrated lateral flexion movement. The subject was asked to practice this movement once, keeping both feet on the floor. The positioning frame level was placed at the upper measurement point (T_{12}) so the inclinometer reads zero. The feet of the frame was in line with T_{12}. Constant and even pressure kept the instrument's feet against the back. The subject was instructed to bend or tilt slowly to the right from the waist without lifting left foot. The movement was a maximum right lateral flexion within the pain tolerance limits. The measurement from the inclinometer was read. The subject was instructed to return to starting position. The inclinometer should return to zero, but If it did not read zero, the measurement was repeated. To measure lateral flexion to the left, the subject was in starting position. The therapist applied constant and even pressure on the feet against the back. The inclinometer should read zero. The subject bent

or tilt slowly the back to the left from the waist keeping right foot on the floor. The movement was a maximum left lateral flexion within the pain tolerance limits. The measurement was taken and the subject was asked again to return to the initial position. The inclinometer should read zero; if not, the measurement was repeated.

Data Collection and Analysis

The following data were retrieved from the chart of 20 low back pain patients. The total number of questions checked on the Roland Scale comprised the disability score for each subject. Each of the three ranges of motion (flexion, extension, lateral flexion) was recorded in degrees for each subject. Means and standard deviations for all variables were computed. Regression analysis was conducted to determine the relationship between the three ROM measures and the disability score.

The total score of the Roland Scale as well as the measurement of flexion, extension and lateral flexion was recorded (See Appendix C).

CHAPTER IV

RESULTS

The data collected of lumbar ROM measurements from 20 subjects are shown in Table 1. The measurements of flexion of the lumbar spine vary from 6 degrees to a maximum of 29 degrees. The extension is recorded from a minimum of 3 degrees to a maximum of 15 degrees; and the lateral flexion varies from 18 degrees to 60 degrees. The total score for the Roland Scale is also shown in Table 1. The higher the score, the more disabled is the subject. The score can vary from zero (no disability) to 24 points (severe disability). The highest and lowest scores recorded were 20 and 2 respectively.

The range of motion and Roland Scale means and standard deviations are presented in Table 2. The lumbar flexion showed a mean of 15.7° and standard deviation (sd) of 6.5°. The extension of lumbar spine had a mean of 8.2° and sd of 3.7°. The measurements of lateral flexion showed a mean of 36.4° and sd of 11.6°. The Roland Scale showed a mean of 10.7° and sd of 5.3°.

The data analysis using the standard multiple regression showed that an R^2=.018 and an adjusted R^2=.023, with no significance at the .05 level (p=.36). The combined variance of the ROM measures cannot explain variability of the Roland Scale. The Pearson Correlation Coefficients between the Roland Scale and the ROM of lumbar spine are summarized in Table 3. The

correlation coefficient between flexion and the Roland Scale was -0.19. The r value for extension and the Roland Scale was -0.22; and the r value of lateral flexion was -0.31. These r values were not significant.

The total score for each statement of the Roland Scale is compiled in Table 4 (See Appendix D). The most frequently checked statement from the Roland Scale with a total of 17 subjects was statement number 2 which states "I change position frequently to try and get my back comfortable"; followed closely by statement 13 "My back is painful almost all the time"; and 21 "I avoid heavy jobs around the house because of my back"; with a total score of 16 each. The least frequently checked statements were numbers 15 "My appetite is not very good because of my back pain"; 19 "Because of my back pain, I get dressed with help from someone else"; and 24 "I stay in bed most of the time because of my back"; each with a total score of 3.

TABLE 1
Measurements of Lumbar ROM[a] in Sagittal and Coronal Planes and Scores of Roland Scale

Subject	Flx*	Ext*	LFlx*	Roland Scale
1	6	5	48	11/24
2	22	15	42	4/24
3	18	10	30	4/24
4	10	12	28	13/24
5	12	4	20	13/24
6	25	3	34	2/24
7	10	8	34	11/24
8	7	3	48	15/24
9	15	10	44	10/24
10	15	8	20	20/24
11	29	6	40	19/24
12	15	3	60	10/24
13	19	5	20	11/24
14	7	6	18	19/24
15	20	5	40	9/24
16	13	8	48	6/24
17	22	8	48	7/24
18	22	10	36	17/24
19	17	13	40	8/24
20	10	15	30	5/24

[a]Units are in degrees

*Flx:Flexion *Ext:Extension *LFlx:Lateral Flexion

TABLE 2

Standard Deviations and Means of Flexion, Extension, and Lateral Flexion of Lumbar Spine and Roland Scale

	Mean	Standard Deviation
Flexion*	15.65	6.50
Extension*	8.15	3.65
Lateral Flexion*	36.40	11.55
Roland Scale	10.70	5.32

*Units are in degrees

TABLE 3

Pearson's Correlation Coefficients

	Roland Scale
Flexion	-0.19
Extension	-0.22
Lateral Flexion	-0.31

CHAPTER V

DISCUSSION

The results of this study show no significant correlations between lumbar range of motion and the Roland disability scale, suggesting that restriction in lumbar range of motion due to low back pain will not determine the disability status of a patient.

The physical therapist takes measurements of the lumbar spine motion to determine limitations in any plane; then, goals are established accordingly. Emphasis is given on taking lumbar ROM as an objective measure to monitor a patient's progress in response to treatment for LBP.[6] Recording these measurements and establishing goals based on them will not indicate any functional limitation, because the results of this study show that lumbar ROM will not predict patients' disability status.

Many factors could influence the lack of agreement between the lumbar ROM and the patient's disability status, as measured by the Roland Scale. One of these factors is the level of effort exerted by the patients during lumbar ROM assessment. Although each patient was asked to flex, extend or laterally flex within the pain tolerance, it is possible that some patients performed these movements beyond the pain limitation, resulting in a greater amplitude of movement. The opposite situation could have happened; some patients may have presented less effort and less movement of the lumbar spine than would

be available with the real limitations. These mentioned factors could be a result of the patient's lack of interest in his or her progress or the patient's willingness to return back to work or normal life as soon as possible.

Another factor to be considered is the questionnaire itself. The statements presented in the questionnaire are asked in a straight forward manner. In other words, the statement "because of my low back pain" does not mention the severity of the pain. The lumbar ROM was recorded "within the pain tolerance" and not as soon as they started to feel low back pain. Also, the questionnaire asks the patient to answer those statements which describe him or her "today". This remark could cause confusion because some patients could answer it according to how they were doing the day or days prior coming for the physical therapy evaluation instead of how they were doing "today".

The intratester reliability of the BROM instrument was established previously.[9] The author of this study performed a pilot to determine the author's intratester reliability on the measurements of lumbar ROM prior to starting this this research project. The correlation coefficients for this tester ranged from 0.58 for extension to 0.89 for flexion. These r values were statistically significant and are considered to show moderate to high correlations; yet the variability demonstrated with this technique, particularly for extension, could be a source of error which would effect the multiple regression analysis. One of the factors that could cause this error is that the skin folds during extension of the lumbar spine, affecting the reading of the BROM instrument.[21] However, the variable which showed high reliability in the pilot study, flexion, also failed to predict the variability of the Roland Scale in this present study.

Pain distribution could affect the results of this study. The study done by Toomey et al[22] concluded that patients with spatial pain will present more restrictions in functional disability. The authors employed the pain drawing technique, utilizing enumeration of total sites of pain as a measure of pain distribution. The patients reporting more spatial pain, in other words, more pain sites, also reported greater deficits on all functional abilities assessed in this study. The pain distribution is also discussed by Clark et al[23], who state that patients with radicular signs will be disabled for longer periods of time. This conclusion suggests that future studies should consider subjects with central LBP versus subjects with peripheral radiating symptoms.

The onset of LBP has to be considered as a factor to determine the effects of pain regarding intensity and flexibility. The patients with LBP, particularly in acute stages, frequently restrict their ROM as a protective response to pain.[24]

Roland and Morris[25] state that a pain rating scale should not be used as a measure of outcome. However, this is used widely by the physical therapist to obtain a better measure of the patient's own perception of pain level. During data collection for this study, it was found that 18 out of 20 subjects defined their subjective pain using a 0 to 10 scale, with 0 being no pain and 10 the worst pain imaginable. These data were analyzed together with the Roland Scale and the lumbar ROM using the Pearson's Product-Moment Correlation Coefficients. The results showed no significant correlations between the pain score and lumbar ROM or the Roland Scale. The r value between pain and flexion was -0.05; between pain and extension, r=0.24; between pain and lateral flexion, r=-0.34; and between pain and Roland Scale was r=0.45. These

results agreed in some respect with another study by Millard[26] which demonstrated a low correlation between the Functional Assessment Screening Questionnaire and the Visual Analogue Scale (r=-0.29).

The results of this study point to the need for the health care professional to measure a patient's functional outcome to determine the effectiveness of the plan of care. The physical therapists are using many tools to assess physical impairment. Goniometry and pain scales are perhaps the most frequently used instruments. However, based on the results of this study, the measurements obtained by these tools may not predict any measure of function as determined by the Roland Scale. Specifically, neither lumbar ROM measurements nor present pain levels will assist the therapist in predicting the patient's functional limitations. Likewise, their progress as defined by increase in ROM or decrease in pain does not necessarily imply functional improvement. ROM is an integral part of the impairment rating evaluation measured by physicians or physical therapists. A percentage of impairment is given to the patient according to the loss of degrees of motion in the lumbar spine. This percentage of impairment is heavily relied upon by the Workers' Compensation Division[23] to determine disability status.

There are several subjective functional scales.[1] Some of them, such as the SIP Scale, are too long, requiring more than 20 minutes to complete and will not be effective to use in a physical therapy clinic. Other scales have not been validated. The Roland Scale has been validated and determined to be a good instrument to measure functional disability. This scale is a small questionnaire which takes only a few minutes to complete. The physical therapist should

include a disability scale such as this for patients with low back pain as part of the patient's assessment and reassessment to judge patients' functional performance and their improvement. Using this scale will be an important tool to determine treatment outcome.

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APPENDIX A

LETTER OF PERMISSION

Katy Medical Center
5602 Medical Center Drive / Katy, Texas 77494
(713) 392-1111

Texas Woman's University
School of Physical Therapy
Houston, Texas

May 6, 1994

Dear Sirs:

The purpose of this letter is to give permission to Osvaldo Plasencia, B.S.P.T. to review the charts and utilize the data of patients who have been referred to physical therapy with a diagnosis of low back pain.

I acknowledge that the data will be utilized as part of his research project.

Sincerely,

Ellen Toelke

Ellen Toelke,P.T.
Director of P.T. Department
Katy Medical Center

EPIC HEALTHCARE GROUP
An Employee-Owned Company

APPENDIX B

ROLAND SCALE

Patient's name:_____ Date:_____

Total Score:_____

When your back hurts, you may find it difficult to do some of the things you normally do.

This list contains some sentences that people have used to describe themselves when they have back pain. When you read them, you may find that some stand out because they describe you today. As you read the list, think of yourself today. When you read a sentence that describes you today, put a check mark against it. If the sentence does not describe you, the leave the space blank and go on the next one. Remember, only check mark the sentence if you are sure that it describes you today.

_____ 1. I stay at home most of the time because of my back.

_____ 2. I change position frequently to try and get my back comfortable.

_____ 3. I walk more slowly than usual because of my back.

_____ 4. Because of my back I am not doing any of the jobs that usually do around the house.

_____ 5. Because of my back, I use a handrail to get upstairs.

_____ 6. Because of my back, I lie down to rest more often.

_____ 7. Because of my back, I have to hold on to something to get out of an easy chair.

_____ 8. Because of my back, I try to get other people to do things for me.

_____ 9. I get dressed more slowly than usual because of my back.

_____10. I only stand up for short periods of time because of my back.

_____11. Because of my back, I try not to bend or kneel down.

_____12. I find it difficult to get out of a chair because of my back.

_____13. My back is painful almost all the time.

_____14. I find it difficult to turn over in bed because of my back.

_____15. My appetite is not very good because of my back pain.

_____16. I have trouble putting on my socks (or stockings) because of the pain in my back.

_____17. I only walk short distances because of my back pain.

_____18. I sleep less well because of my back.

_____19. Because of my back pain, I get dressed with help from someone else.

_____20. I sit down for most of the day because of my back.

_____21. I avoid heavy jobs around the house because of my back

_____22. Because of my back, I am more irritable and bad tempered with people than usual.

_____23. Because of my back, I go upstairs more slowly than usual.

_____24. I stay in bed most of the time because of my back.

APPENDIX C

BROM RECORDING SHEET

BROM RECORDING SHEET

NAME:_____ DATE:_____

FLEXION	1	2
STARTING POSITION	.....	.....
FULL FLEXION READING	.....	.....
TRUE FLEXION	_____	_____

EXTENSION		
STARTING POSITION	.....	.....
FULL EXTENSION READING	.....	.....
TRUE EXTENSION	_____	_____

RIGHT LATERAL FLEXION	_____	_____
LEFT LATERAL FLEXION	_____	_____

APPENDIX D

TABLE 4

TABLE 4

Number of Patients Who Checked Each Statement of the Roland Scale*

Statements	Number of patients
1. I stay at home most of the time because of my back.	4
2. I change position frequently to try and get my back comfortable.	17
3. I walk more slowly than usual because of my back.	14
4. Because of my back I am not doing any of the jobs that usually do around the house.	10
5. Because of my back, I use a handrail to get upstairs.	5
6. Because of my back, I lie down to rest more often.	13
7. Because of my back, I have to hold on to something to get out of an easy chair.	7
8. Because of my back, I try to get other people to do things for me.	9
9. I get dressed more slowly than usual because of my back.	7
10. I only stand up for short periods of time because of my back.	8
11. Because of my back, I try not to bend or kneel down.	11
12. I find it difficult to get out of a chair because of my back.	7
13. My back is painful almost all the time.	16
14. I find it difficult to turn over in bed because of my back.	10
15. My appetite is not very good because of my back pain.	3
16. I have trouble putting on my socks (or stockings) because of the pain in my back	8
17. I only walk short distances because of my back pain.	9
18. I sleep less well because of my back.	12
19. Because of my back pain, I get dressed with help from someone else.	3
20. I sit down for most of the day because of my back.	4
21. I avoid heavy jobs around the house because of my back	16
22. Because of my back, I am more irritable and bad tempered with people than usual.	9
23. Because of my back, I go upstairs more slowly than usual.	9
24. I stay in bed most of the time because of my back.	9

*Twenty subjects completed the Roland Scale