

VILNIUS UNIVERSITY

Svetlana Lenickienė

THE EFFECTIVENESS OF MULTIDISCIPLINARY REHABILITATION IN PATIENTS  
WITH DISC RELATED LUMBOSACRAL RADICULOPATHY

Summary of Doctoral Dissertation  
Biomedical sciences, medicine (06 B)

Vilnius, 2011

The doctoral thesis was carried out at the Centre of Rehabilitation, Physical and Sport Medicine, the Institute of the Rehabilitation, Sport Medicine and Nursing, Faculty of Medicine, Vilnius University in 2007-2011

**Principal supervisor:**

Prof. Dr. **Alvydas Juocevičius** (Vilnius University, biomedical sciences, medicine – 06 B)

**Consultant:**

Assoc. Prof. Dr. Gintaras Kaubrys (Vilnius University, biomedical sciences, medicine – 06 B)

**The doctoral dissertation is defended at Vilnius University, the Academic Research Board in Medicine:**

**Chairman:**

Prof. Dr. **Janina Tutkuvienė** (Vilnius University, biomedical sciences, medicine – 06 B)

**Members:**

Prof. Dr. **Valmantas Budrys** (Vilnius University, biomedical sciences, medicine – 06 B)

Prof. Dr. **Janina Didžiapetrienė** (Vilnius University, Institute of Oncology, biomedical sciences, medicine – 06 B)

Assoc. Prof. Dr. **Nomeda Rima Valevičienė** (Vilnius University, biomedical sciences, medicine – 06 B)

Assoc. Prof. Dr. **Julius Griškevičius** (Vilnius Gediminas Technical University, technology sciences, mechanics engineering – 07 T)

**Opponents:**

Assoc. Prof. Dr. **Dalius Jatužis** (Vilnius University, biomedical sciences, medicine – 06 B)

Assoc. Prof. Dr. **Andžela Šešok** (Vilnius Gediminas Technical University, technology sciences, mechanics engineering – 07 T)

The public defence of doctoral thesis will be held at the meeting of the Academic Research Board in Medicine on September 20, 2011, at 14.00 in the Conference Hall of Vilnius University Hospital Santariškių klinikos.

Address: Santariškių str. 2, LT-08661, Vilnius, LT-08661, Lithuania

The summary of the doctoral thesis has been sent on August 19, 2011  
The doctoral thesis is available at the Vilnius University Library.

ILNIAUS UNIVERSITETAS

Svetlana Lenickienė

SERGANČIŲJŲ DISKOGENINĖ JUOSMENINĖ KRYŽMENS RADIKULOPATIJA  
KOMPLEKSNĖS DAUGIADISCIPLININĖS REABILITACIJOS EFEKTYVUMAS

Daktaro disertacijos santrauka  
Biomedicinos mokslai, medicina (06 B)

Vilnius, 2011

Disertacija rengta 2007 – 2011 metais Vilniaus universitete.

**Mokslinis vadovas:**

Prof. dr. **Alvydas Juocevičius** (Vilniaus universitetas, biomedicinos mokslai, medicina – 06 B)

**Konsultantas:**

Doc. dr. Gintaras Kaubrys (Vilniaus universitetas, biomedicinos mokslai, medicina – 06 B)

**Disertacija ginama Vilniaus universiteto Medicinos mokslo krypties taryboje:**

**Tarybos pirmininkė:**

Prof. dr. **Janina Tutkuvienė** (Vilniaus universitetas, biomedicinos mokslai, medicina – 06 B)

**Nariai:**

Prof. dr. **Valmantas Budrys** (Vilniaus universitetas, biomedicinos mokslai, medicina – 06 B);

Prof. dr. **Janina Didžiapetrienė** (Vilniaus universiteto Onkologijos institutas, biomedicinos mokslai, medicina – 06 B)

Doc. dr. **Nomeda Rima Valevičienė** (Vilniaus universitetas, biomedicinos mokslai, medicina - 06 B)

Doc. dr. **Julius Griškevičius** (Vilniaus Gedimino technikos universitetas, technologijos mokslai, mechanikos inžinerija – 07 T)

**Oponentai:**

Doc. dr. **Dalius Jatužis** (Vilniaus universitetas, biomedicinos mokslai, medicina – 06 B)

Doc. dr. **Andžela Šešok** (Vilniaus Gedimino technikos universitetas, technologijos mokslai, mechanikos inžinerija – 07 T).

Disertacija bus ginama viešame Medicinos mokslo krypties tarybos posėdyje 2011 m. rugsėjo mėn. 20 d. 14 val. Vilniaus universiteto Ligoninių Santariškių Klinikos konferencijų salėje.

Adresas: Santariškių g. 2, LT-08661, Vilnius, Lietuva

Disertacijos santrauka išsiųsta 2011 m. rugpjūčio mėn. 19 d.

Su disertacija galima susipažinti Vilniaus universiteto bibliotekoje.

## INTRODUCTION

“More than 99% of low back problems present with back pain and it is rare to see a low back problem with no back pain. Pain always tends to radiate distally and 70% of patients with back pain also have some pain down one or both legs” is stated in Gordon Waddell monograph “The Back Pain Revolution” (2004). The author emphasises that neurological symptoms are present less often, but their identification is essential for the proper diagnosis formulation. Low back pain and low back related disorders, including lumbosacral radiculopathy, are one of the common reasons patients present to primary care practices (Gregory et al., 2008, Taimela et al. 2004). According to the Bulletin of the World Health organisation the lifetime prevalence of low back pain is 58-84% and the point prevalence is 4-33% (Woolf, Pfleger, 2003). The prevalence of lumbosacral radiculopathy due to nerve root compression or irritation is difficult to estimate as diagnosis requires thorough clinical examination, but, in a large epidemiological study of 7217 persons, Heliovaara and collaborators (1987) showed the lifetime prevalence of herniated lumbar disc of 5.1% for men and 3.7% for women. However, the nowadays presenting data are controversial. The last decade papers present significantly higher data of lumbosacral radiculopathy prevalence that varies from 9.9% to 25% (Van Boxem et al, 2010) so the exact data are still hardly available. Although low back pain is a very frequent condition, it has the reputation to resolve spontaneously. Thus pain duration is usually self-limited, with resolution in up to 90% of low back pain cases in 6 weeks (van Tulder et al., 2006). Involvement of adjacent lumbosacral nerve roots resulting in neural dysfunction and pain might be more resistant to conservative approach than low back pain itself. Despite the favourable prognosis of these conditions about 20%-30% patients have persisting problems after one or two years due to lumbosacral radiculopathy (Koes et al., 2007). These conditions are a leading cause in job-related disability in industrialised countries in people under 45 years of age and the third cause of disability in those over 45 years of age (Weinstein et al, 1998) that has massive impact not only on individuals but on society, as the longer a person is on sick leave the less likely he or she is to return to work. After six months off work, less than 50% of people will return to work, 25% - if off work lasts 1 year

and after two years' absence, there is little chance of the person's returning (Woolf, Pflieger, 2003). This results in marked economic consequences, as the indirect financial costs, related to working absenteeism, production losses, insurance costs, 7-8 times exceed direct health care costs (Maniadakis, Gray, 2000, Walker et al, 2003). Unfortunately, low back disorders are one of the common reasons for people claiming disability pensions, along with mental and cardiovascular disorders (Woolf, Pflieger, 2003). For example, in Norway, according to The Norwegian Back Pain Network (2002), in 1995 there were more than 35 000 people who were on disablement benefit due to back problems, and each year 3000-4000 are added due to the same cause, among people on sick leave in 1995, 15-17 % named back problems as the cause of their situation, the same did 13 % of those on disablement benefit. So, why low back disorders related disability has reached the epidemic proportions? What are the barriers to recovery? They may exist already before the initial pain onset, or may develop after the onset of pain.

During the last two decades the number of evidences, proving that psychosocial factors influences the development of low back related disability, increased (Coste et al, 1994; Burton et al, 1995; Hoogendoorn et al, 2000; Currie, Wang, 2005; Kikuchi, 2008). In a review of 37 prospective studies, evaluating psychological risk factors in back and neck pain, Linton (2000) concludes that 1) psychological factors are associated with the onset of back pain, 2) psychosocial factors may be predictive of back-related disability and 3) depression and anxiety are associated both with pain and disability. Hoogendoorn with co-authors (2000) performing a systematic review of 11 cohort and 2 case-control studies found strong evidence for low social support in the workplace and low job satisfaction as risk factors for back pain. Considering that risk factors for developing spine pain are multidimensional, such as physical attributes, socioeconomic status, general medical health, psychological state and occupational environmental factors (Rubin, 2007), low back disorders including disc related lumbosacral radiculopathy can be assumed as a complex condition, demanding whether assessing or treating acute or chronic pain syndromes, management that include a biopsychosocial approach (Stanos, 2007).

In order to help patients suffering from low back pain related disorders to overcome various barriers to recovery medical, psychological and social, the use of multidisciplinary rehabilitation is expedient. Guzman and colleagues (2001) defined multidisciplinary biopsychosocial rehabilitation as a minimum of the physical dimension and one of the other dimensions (psychological or social or occupational) being included in the rehabilitation programme. The use of multidisciplinary rehabilitation and its effect on patients results such as pain reduction, return to activities and participation including work is widely analysed and discussed in the scientific literature, but only the cases of chronic non-specific low back pain are highlighted (Guzman et al., 2001; Vollenbroek-Hutten et al., 2004; Kaapa et al., 2006; Smeets et al., 2006; van Geen et al., 2007; Roche et al., 2007; van Middelkoop et al., 2011). Although health care institutions in some countries have confirmed national clinical guidelines regarding low back pain management (Koes et al., 2001), the accessibility of clinical guidelines regarding disc related lumbosacral radiculopathy is limited, because there is a lack of trials evaluating the effectiveness of behavioural treatment and multidisciplinary treatment programmes in cases of lumbosacral radiculopathy (Koes et al., 2007). Generally is accepted that initial management of lumbosacral radiculopathy, not presenting signs of cauda equina syndrome, is conservative, with about 60 % of patients reporting satisfactory results regarding pain reduction and function improvement (Atlas et al., 2005). Hahne and collaborators (2010) performed a systematic review of 18 randomised controlled trials involving 1671 participants in order to determine the efficacy of conservative treatments for people who have lumbar disc herniation with associated radiculopathy. The types of evaluated conservative treatments were: advice, medication, traction, physical therapy, manipulation, laser therapy, ultrasound, corsets and multimodal programme, but the availability of trials evaluating multidisciplinary approach was missing. Koes and co-authors (2007) in performed clinical review emphasised that “no trial has yet evaluated the effectiveness of behavioural treatment and multidisciplinary treatment programmes” in cases of lumbosacral radiculopathy. The subject of multidisciplinary rehabilitation usefulness for patients with disc related lumbosacral radiculopathy is insufficiently analysed in scientific literature, thus the search and establishment of effective

rehabilitation including multidisciplinary rehabilitation programmes, designed for patients with disc related lumbosacral radiculopathy, is a relevant nowadays health care object.

### **THE AIM OF THE STUDY**

To evaluate the likely existing links between the applied different outpatient rehabilitation programmes content and patients experienced pain intensity, physical, functional and psychoemotional changes in population with disc related lumbosacral radiculopathy.

### **THE MAIN TASKS OF THE STUDY**

1. To evaluate the main features of demographic characteristics of patients undergoing different outpatient rehabilitation programmes due to disc related lumbosacral radiculopathy.
2. To analyse the differences in the effectiveness of applied multidisciplinary rehabilitation programme and non-multidisciplinary rehabilitation programme in management of disc related lumbosacral radiculopathy on patients experienced pain intensity, physical assessment parameters and functional status changes.
3. To compare the changes in disc related lumbosacral radiculopathy patients experienced pain intensity, physical parameters, functional and psychoemotional status, applying different methods of low back structures traction, as a part of multidisciplinary rehabilitation programme content.
4. To determine the dependence of functional status changes during the course of different outpatient rehabilitation programmes and the experienced pain stage in patients with disc related lumbosacral radiculopathy.
5. To determine the correlations between functional status on discharge and experienced pain intensity, physical parameters and demographic characteristics in disc related lumbosacral radiculopathy patients; on base of linear multivariate regression to make the mathematical prediction models of multidisciplinary rehabilitation programme's effectiveness with reference to established correlations.



## **RELEVANCE AND NOVELTY OF THE STUDY**

This study is devoted to the issue of multidisciplinary rehabilitation programme's influence on patients' experienced pain intensity, physical parameters and functional status in cases of disc related lumbosacral radiculopathy as well as the possibility to suggest, according to the study findings, practical recommendations on how to improve patients results. Considering the low back disorders as a complex, multidimensional condition, the use of biopsychosocial approach is assumed. The available sources provide evidence that multidisciplinary rehabilitation produces greater improvements in pain and function than non-multidisciplinary rehabilitation or usual care in cases of disabling chronic non-specific low back pain. The knowledge and nowadays available existing evidence to guide recommendations for multidisciplinary rehabilitation for lumbosacral radiculopathy are insufficient.

We evaluated the effectiveness of multidisciplinary rehabilitation programme in cases of disc related lumbosacral radiculopathy. There was established that multidisciplinary rehabilitation programme provide significantly better functional status improvement in patients with acute pain due to disc related lumbosacral radiculopathy than non- multidisciplinary rehabilitation programme. Accomplishing the study data analysis the correlations between various patients' characteristics and parameters were established and mathematical prediction models of likely results completing the multidisciplinary rehabilitation programme were made. During the study for the first time in Lithuania the new method of instrumental spinal function's assessment in patients with disc related lumbosacral radiculopathy, using new computerised device "the Insight Subluxation Station", was implemented. The suggested model of outpatient multidisciplinary rehabilitation „PRM and Patients with Low Back Pain Complicated by Radiculopathy“ is the first programme of care devoted for patients with lumbosacral radiculopathy that fitted the European accreditation standards and was accredited by UEMS RPM Section & Board Clinical Affairs Committee in 2010 and is available at: [www.euro-prm.org](http://www.euro-prm.org).

## **STATEMENTS TO BE DEFENDED**

1. Multidisciplinary rehabilitation programme applied in outpatient rehabilitation setting significantly reduce pain intensity, improve physical assessment parameters, advance functional status and, as sequence of it, induce complex daily or work – related activities and participation in patients with disc related lumbosacral radiculopathy.
2. The effectiveness of multidisciplinary rehabilitation, applied for patients with disc related lumbosacral radiculopathy, is influenced by the content or the rehabilitation programme and other factors established on the arrival to rehabilitation setting, such as patients' demographic characteristics, experienced pain intensity, physical parameters and functional status.

## **STUDY MATERIAL AND METHODS**

During the period from 2007 to 2011 the data of 277 patients who underwent the course of outpatient rehabilitation programmes of different contents due to disc related lumbosacral radiculopathy in the Outpatient Rehabilitation Department, the Centre of Rehabilitation, Physical and Sport Medicine, Vilnius University Hospital Santariškių klinikos were collected and analysed.

The research was fulfilled by two stages. During the first stage of the research the data of 127 patients with disc related lumbosacral radiculopathy, who completed the course of outpatient rehabilitation programme in 2006-2007, were analysed. Those patients made up the retrospective group of the study. The retrospective group consisted of 46 male and 81 female patients. Mean age of those patients was  $49.94 \pm 11.23$  years. Main demographic and social characteristics of the patients such as gender, age, education level, social status and the pattern of work and/or lifestyle were evaluated as well as the duration of the outpatient rehabilitation course. The mentioned data were analysed in order to estimate the main prevalent demographic and social characteristics of disc related lumbosacral radiculopathy patients, to compare the first study stage patients' characteristics with the second study stage patients' characteristics and to evaluate the consistency of the patients contingent, undergoing outpatient rehabilitation programmes due to disc related lumbosacral

radiculopathy, over the years. The duration of out patient rehabilitation programme of retrospective patients group was collected in order to create prospective study patients' evaluation protocol and to establish the terms of prospective group patients evaluation at the beginning of rehabilitation course and completing the course. The mean duration of the outpatient rehabilitation programme in retrospective group made up full 18 consecutive days and almost 14 working days spent in therapies from Monday to Friday.

The second stage of the study was performed prospectively during period of time from 2009 to 2011. 150 patients with disc related lumbosacral radiculopathy participated in the prospective study. To the final analysis due to a dropout the data of 139 were included. There were 58 male (41.7 %) and 81 female (58.3 %) patients. Mean age of the patients participating in prospective study was  $46.43 \pm 11.79$  years. The objective of the second stage of the study was to evaluate the influence of different outpatient rehabilitation programmes on changes in patients experienced pain intensity, physical parameters and functional status in cases of disc related lumbosacral radiculopathy. Patients participating in the prospective study were randomly allocated to the two groups: group I and group II. The group I patients were administered the multidisciplinary rehabilitation (MR) programme, the group II patients were administered non-multidisciplinary rehabilitation (NMR) programme. The core set of both rehabilitation programmes applied for patients with disc related lumbosacral radiculopathy included daily, from Monday to Friday, performed physiotherapy, one hour per day duration, physical agents usage (electrical currents, magnetic fields, ultrasound, laser, whirlpool) and massage procedures. Both groups were managed by the same specialists, using same techniques and methodology. The content of multidisciplinary rehabilitation programme for each group I patient was complemented by psychologist's consultation, social worker's consultation and patient education procedure regarding ergonomics and work-related issues. Group I patients were managed using team approach, when the rehabilitation process and team work was supervised and coordinated by the PRM physician during weekly meetings, were patient's progress was discussed with team members. Group II patients' progress during the rehabilitation programme was supervised by PRM physician, not ensuring general meetings with other specialists involved in programme performance.

All the patients participating in prospective study, i.e. group I and group II patients, were examined according to the study protocol within first three days from the arrival day to the rehabilitation centre and on the 14<sup>th</sup> day after the initial evaluation before completing the rehabilitation programme. The next factors and parameters were assessed: demographic patients' characteristics (gender, age); social patients' characteristics (education level, social status, pattern of work and/or lifestyle, marital status, the duration of current sick-leave); some of the anthropometric characteristics (height, weight, body mass index); the level of herniated disc, confirmed by computer tomography scan or magnetic resonance imaging, and its direction; the duration of low back pain in general, the duration of current episode of low back and/or radiating leg pain, the experienced low back and leg intensity, valued separately, using VAS and NRS; clinical neurological signs (straight leg raising test, deep-tendon reflexes, sensory and motor examination, according to key dermatomes and myotomes); spinal mobility (fingertip-floor distance, modified Schober test) and functional status and back related disability valued by Oswestry Disability Index and Roland-Morris disability questionnaire. For group I patients, i.e. patients participating in multidisciplinary rehabilitation programme, additional assessments were made: emotional status was evaluated using Hospital Anxiety and Depression Scale and Zung Depression Scale; NeuroSpinal condition was evaluated using computerised multidimensional technology „The Insight Subluxation Station“ (USA), evaluating its single overall quantitative measure – NeuroSpinal Function Index (NSFI).

In order to compare the changes in disc related lumbosacral radiculopathy patients experienced pain intensity, physical parameters, functional and emotional status, applying different methods of low back structures traction, as a part of multidisciplinary rehabilitation programme content, group I patients were randomised in three subgroups: **I-A, I-B, I-C**. Each subgroup was allocated to different type of low back structures traction as a part of physiotherapy procedure in the rehabilitation programme content: subgroup I-A patients were allocated to dynamic traction exercises performed in pool, subgroup I-B patients were allocated to dynamic underwater traction, subgroup I-C patients were allocated to static motorised lumbar traction performed on traction couch, using Enraf-Nonius Eltrac 471 unit

(NL).. The duration of any low back structures traction procedure in every single subgroup of multidisciplinary rehabilitation programme group was 30 minutes.

To the final data analysis due to dropout the data of 266 patients were included.

### **Statistical analysis**

Statistical analysis package SPSS version 15.0 and Microsoft Office Excel 2003 programme were used for the data management and calculations of the results. The significance level was set at  $p < 0.05$ . Descriptive statistics were used to characterise the study population. Groups' differences were assessed using independent samples t-test for numerical variables and the Chi – Square test or Mann - Whitney *U* test for categorical variables when evaluating two groups, and ANOVA model and the Chi – Square test or Kruskal-Wallis test were used evaluating three groups. Within groups changes over time were assessed by the paired samples t-test and Wilcoxon signed-rank test. Correlation analysis of variable was performed using Pearson coefficient. The influence of initial variables on the after rehabilitation results was assessed by creating linear multivariate regression models.

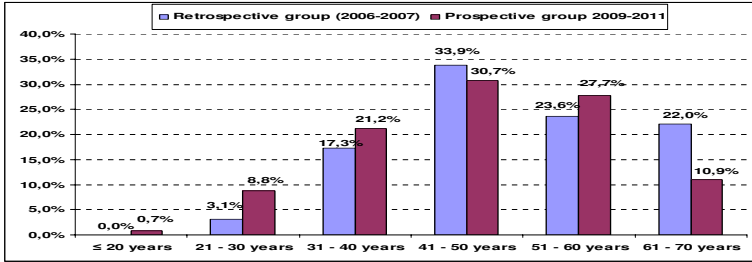
## **RESULTS**

### **1. The analysis of main prevalent demographic and social characteristics of disc related lumbosacral radiculopathy patients**

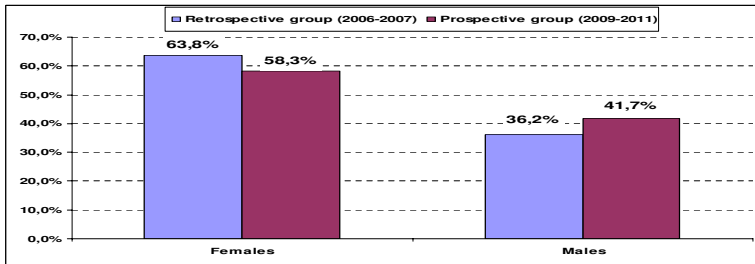
The mean age of retrospective study group patients was  $49.94 \pm 11.23$  years. In this group there were 46 male and 81 female patients that made up 36.2% and 63.8% respectively. Male patients in retrospective group were younger than female patients, though this difference was not significant: males mean age was  $47.85 \pm 13.2$  and females –  $51.12 \pm 9.8$  years ( $p = 0.147$ ). The mean duration of the outpatient rehabilitation programme in retrospective group was  $18.38 \pm 2.5$  consecutive days and  $13.54 \pm 1.14$  working days spent in therapies from Monday to Friday.

Mean age of the patients participating in prospective study was  $46.43 \pm 11.79$  years. There were 58 male and 81 female patients that made up 41.7 % and 58.3 %. Male patients participating in prospective study were significantly younger than female. Mean age of males was  $43.45 \pm 12.4$  years and females –  $48.57 \pm 10.3$  years ( $p = 0.011$ ).

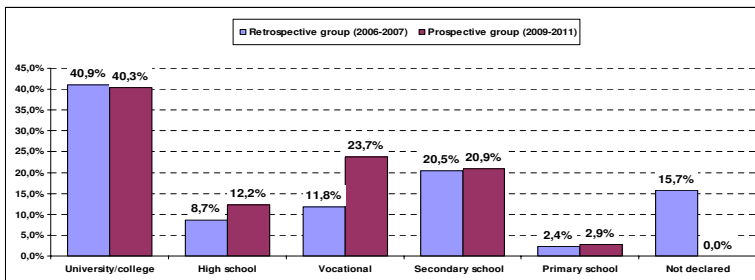
Both study stages data comparison revealed that retrospective and prospective groups patients statistically did not differ ( $p > 0.05$ ) according main valued demographic and social characteristics (figures 1, 2, 3, 4).



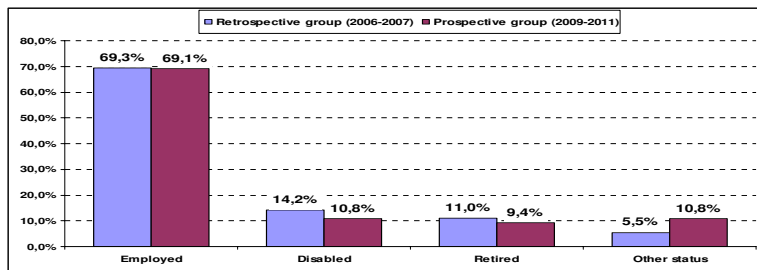
**Figure 1** Retrospective and prospective groups' patients' distribution according age ( $p = 0.187$ )



**Figure 2** Retrospective and prospective groups' patients' distribution according gender ( $p = 0.380$ )



**Figure 3** Retrospective and prospective groups' patients' distribution according education ( $p = 0.143$ )



**Figure 4** Retrospective and prospective groups' patients' distribution according social status (p = 0.387)

Study's data analysis showed that the most part of all the analysed 266 patients were people in age range from 41 to 60 years, they made up 55.7% of all the patients who underwent outpatient rehabilitation programmes due to disc related lumbosacral radiculopathy in 2006-2011, the mean age of the patients was  $48.11 \pm 11.64$  years. Women made up 60.9% of all the patients. Considering the constancy of patients' participating in the study prevalent demographic characteristics it could be supposed that the main patients' contingent who are disturbed by disc related lumbosacral radiculopathy and are seeking for medical care and rehabilitation are those of working, young and middle.

## 2. Comparison of multidisciplinary rehabilitation programme's and non-multidisciplinary rehabilitation programme's effectiveness in management of disc related lumbosacral radiculopathy

Patient's baseline general characteristics data are presented Table 1. Patients did not significantly differ in both groups, i.e. group I (multidisciplinary rehabilitation programme) and group II (non-multidisciplinary rehabilitation programme). According to age and gender patients distributed almost equally in both groups (p = 0.875 and p = 0.986 respectively).

**Table 1.** Baseline general socio-demographic characteristics of the patients allocated to different outpatient rehabilitation programmes groups

Baseline general characteristics	Group I (MRP) n = 84	Mean $\pm$ SD or %	Group II (NMRP) n = 55	Mean $\pm$ SD or %	p value
Age (years)	84	$46.56 \pm 11.01$	55	$46.24 \pm 12.98$	0.875*
Body Mass Index (kg/m <sup>2</sup> )	84	$28.0 \pm 4.06$	55	$28.9 \pm 5.07$	0.217*
Gender	35	41.7 %	23	41.8 %	0.986**

Males	49	58.3 %	32	58.2 %	
Females					
<b>Education</b>					
University degree	31	36.9 %	16	29.1 %	0.621**
College	7	8.3 %	2	3.6 %	
High school	9	10.7 %	8	14.5 %	
Secondary school	15	17.9 %	14	25.5 %	
Vocational	19	22.6 %	14	25.5 %	
Primary school	3	3.6 %	1	1.8 %	
<b>Social status</b>					
Employed	61	72.6 %	35	63.6 %	0.155**
Retired	8	9.5 %	5	9.1 %	
Disabled	10	11.9 %	5	9.1 %	
Other	5	6.0 %	10	18.2 %	
<b>Work/lifestyle pattern</b>					
Heavy physically loaded	9	10.7 %	6	10.9 %	0.614**
Physically loaded	33	39.3 %	26	47.3 %	
Sedentary	42	50.0 %	23	41.8 %	
<b>Marital status</b>					
Married	71	84.5 %	42	76.4 %	0.115**
Single	3	3.6 %	5	9.1 %	
Divorced	3	3.6 %	6	10.9 %	
Widowed	7	8.3 %	2	3.6 %	

MRP – multidisciplinary rehabilitation programme; NMRP – non-multidisciplinary rehabilitation programme; n - number of cases; SD – standard deviation; \* – independent samples t-test; \*\* – Chi-Square test.

The analysis of patients' current experienced pain duration on the day of initial evaluation revealed that there was not statistically significant difference in pain duration in both participating groups ( $p = 0.083$ ), though patients in Group II (non-multidisciplinary rehabilitation programme) arrived to outpatient rehabilitation setting almost 1 week earlier (Table 2). According the estimated pain stage patients in Group I and Group II did not differ ( $p = 0.120$ ), in both groups patients experiencing acute and sub-acute pain dominated.

**Table 2. Patients' pain duration characteristics in different outpatient rehabilitation programmes groups**

Pain duration characteristics	Group I (MRP) n = 84	Mean ± SD or %	Group II (NMRP) n = 55	Mean ± SD or %	p value
<b>Pain duration (weeks)</b>		8.46 ± 5.2		6.98 ± 4.4	0.083*
<b>Pain duration stage:</b>					
Acute pain (<6 weeks)	31	36.9 %	25	45.5 %	0.120**
Sub-acute pain (6≤weeks<12)	30	35.7 %	23	41.8 %	
Chronic pain (≥12 weeks)	23	27.4 %	7	12.7 %	

MRP - multidisciplinary rehabilitation programme; NMR - non-multidisciplinary rehabilitation programme; n - number of cases; SD – standard deviation; \* – independent samples t-test; \*\* – Chi-Square test.

Analysis of the basic evaluated parameters' data including physical assessment and functional status parameters of the both groups' patients on the arrival revealed that there



was not statistically significant difference ( $p>0.05$ ) between Group I and Group II patients, though it was observed that Group II patients declared significantly higher values of experienced leg and low back pain intensity, using both pain scales VAS and NRS ( $p<0.05$ ) (Table 3), that might be related to somewhat different, but not significant ( $p = 0.083$ ) (Table 2), duration of experienced pain between both groups.

**Table 3. Pre-rehabilitation values of basic patients' evaluation parameters in groups of different outpatient rehabilitation programmes**

Parameters on arrival	Group I (MRP) n = 84		Group II (NMRP) n = 55		p value
	Mean	SD	Mean	SD	
VAS low back (mm)	44.6	24.8	54.2	21.7	0,022*
VAS leg (mm)	41.2	25.9	52.7	25.5	0,012*
NRS low back in rest (points)	3.8	2.3	5.0	2.1	0,002**
NRS low back in motion (points)	5.0	2.4	6.2	2.1	0,004**
NRS leg in rest (points)	3.4	2.4	4.8	2.6	0,003**
NRS leg in motion (points)	4.9	2.5	5.7	2.5	0,059**
Fingertip-floor distance (cm)	24.3	15.9	27.7	16.1	0,219*
Modified Schober test (cm)	20.8	2.0	20.2	1.6	0,074*
Straight leg raising test (°)	49.5	14.2	45.5	16.7	0,130*
ODI (%)	40.6	15.2	43.0	17.0	0,382*
RMDQ low back (points)	9.6	5.4	10.4	6.0	0,446*
RMDQ leg (points)	8.5	6.0	9.1	6.8	0,645*

MRP – multidisciplinary rehabilitation programme; NMRP – non-multidisciplinary rehabilitation programme;

n – number of cases; SD – standard deviation; VAS – visual analogue scale; NRS – numerical rating scale;

ODI – Oswestry Disability Index; RMDQ – Roland – Morris disability questionnaire; \* – independent samples t-test;

\*\* – Mann - Whitney U test.

Comparison of the basic evaluated parameters' changes occurred within the course of applied different outpatient rehabilitation programmes showed that statistically significant difference was observed in lumbosacral nerves roots irritation sign, evaluated by straight leg raising test, and functional patients' status, measured both by Oswestry Disability Index and Roland – Morris Disability Questionnaire, changes ( $p<0.01$ ), demonstrating better results in Group I (multidisciplinary rehabilitation programme) patients (Table 4). Other parameters' changes did not differ significantly between the two groups ( $p>0.05$ ).

**Table 4. Comparison of basic patients' evaluation parameters' changes after rehabilitation in groups of different outpatient rehabilitation programmes**

Parameters changes	Group I (MRP) n = 84		Group II (NMRP) n = 55		p value
	Change Mean	SD	Change Mean	SD	
VAS low back (mm)	20.3	19.9	14.8	23.0	0.185*
VAS leg (mm)	20.3	20.4	12.6	21.3	0.068*

NRS low back in rest (points)	1.6	1.6	1.2	2.2	0.173**
NRS low back in motion (points)	1.6	2.0	1.2	2.2	0.181**
NRS leg in rest (points)	2.2	2.1	1.6	2.3	0.255**
NRS leg in motion (points)	2.3	2.0	1.6	2.2	0.072**
Fingertip-floor distance (cm)	8.4	7.3	5.4	10.3	<b>0.054*</b>
Modified Schober test (cm)	-0.7	2.6	-0.9	1.2	0.561*
Straight leg raising test (°)	-19.0	11.8	-7.6	12.0	<b>&lt;0.001*</b>
ODI (%)	15.3	11.8	8.1	15.3	<b>0.004*</b>
RMDQ low back (points)	3.8	4.0	1.5	4.6	<b>0.003*</b>
RMDQ leg (points)	3.2	3.9	1.1	3.7	<b>0.005*</b>

MRP – multidisciplinary rehabilitation programme; NMRP – non-multidisciplinary rehabilitation programme;  
n – number of cases; SD – standard deviation; VAS – visual analogue scale; NRS – numerical rating scale;  
ODI – Oswestry Disability Index; RMDQ – Roland – Morris disability questionnaire; \* – independent samples t-test;  
\*\* – Mann – Whitney *U* test.

The results of the study shows that multidisciplinary rehabilitation programme is more effective than non-multidisciplinary rehabilitation programme especially in regard to functional status of patients suffering from disc related lumbosacral radiculopathy.

### 3. Results of the comparison of different low back structures traction methods, as a part of multidisciplinary rehabilitation programme content, in management of disc related lumbosacral radiculopathy

Patients participating in different multidisciplinary rehabilitation programme subgroups according to additionally applied different method of low back structures traction did not significantly differ by their baseline general characteristics ( $p>0.05$ ), which are presented in Table 5.

**Table 5. Baseline general characteristics of the multidisciplinary rehabilitation patients allocated to different low back traction methods subgroups**

Baseline general characteristics	Subgroup I-A (traction exercises in pool) n = 31		Subgroup I-B (underwater traction) n = 31		Subgroup I-C (motorised traction on couch) n = 22		p value
	Mean	SD	Mean	SD	Mean	SD	
Age (years)	48.7	10.3	45.7	9.7	44.6	13.5	0.353*
<b>Gender</b>							
Males, n (%)	12 (38.7)		13 (41.9)		10 (45.5)		0.886**
Females, n (%)	19 (61.3)		18 (58.1)		12 (54.5)		
Height (cm)	168.0	9.9	169.3	8.3	171.1	10.8	0.502*
Weight (kg)	80.4	14.1	79.0	11.2	81.3	11.5	0.797*
BMI (kg/m <sup>2</sup> )	28.4	4.1	27.7	4.5	27.8	3.5	0.770*
Pain duration (weeks)	8.3	5.9	9.2	5.9	8.0	3.8	0.729*

n – number of cases; SD – standard deviation; BMI – body mass index; \* – ANOVA; \*\* – Chi-Square test.

The values of main assessed patients' parameters in all three subgroups of multidisciplinary rehabilitation programme group established during the initial patients' evaluation are presented in Table 6. Data analysis revealed that patients allocated to the three subgroups were similar ( $p>0.05$ ) in most of the parameters; significant difference was observed just according two of the assessed parameters. Thus, patients participating in subgroup, where multidisciplinary rehabilitation programme was supplemented by low back structures traction exercises performed in pool, declared significantly higher disability due to low back pain, measured by Roland – Morris Disability Questionnaire, comparing their values with underwater traction subgroup ( $p<0.014$ ) and patients of motorised lumbar traction performed on couch subgroup had significantly lower NeuroSpinal Function Index, measured by computerised multidimensional technology „The Insight Subluxation Station“, comparing to the other two subgroups ( $p<0.003$ ). Emotional patients' status did not differ in all three evaluated subgroups ( $p>0.05$ ).

**Table 6. Pre-rehabilitation values of basic patients' evaluation parameters in different low back traction methods subgroups of multidisciplinary rehabilitation programme**

Parameters on arrival	Subgroup I-A (traction exercises in pool) n = 31		Subgroup I-B (underwater traction) n = 31		Subgroup I-C (motorised traction on couch) n = 22		p value
	Mean	SD	Mean	SD	Mean	SD	
VAS low back (mm)	47.4	24.2	39.7	24.3	47.7	26.6	0.384*
VAS leg (mm)	45.3	23.2	38.5	26.6	39.2	29.0	0.539*
NRS low back in rest (points)	3.9	2.0	3.2	2.3	4.5	2.6	0.259**
NRS low back in motion (points)	5.4	2.3	4.4	2.4	5.5	2.5	0.147**
NRS leg in rest (points)	3.8	2.4	3.0	2.4	3.5	2.5	0.410**
NRS leg in motion (points)	5.4	2.4	4.4	2.3	4.8	2.9	0.256**
Fingertip-floor distance (cm)	23.4	16.4	23.2	15.4	27.0	16.2	0.639*
Modified Schober test (cm)	20.8	2.3	20.9	1.6	20.6	2.2	0.892*
Straight leg raising test (°)	46.8	13.7	51.6	14.7	50.5	14.2	0.396*
ODI (%)	42.7	12.7	38.0	16.6	41.2	16.5	0.472*
RMDQ low back (points)	11.5 ( $p=0.010$ )	4.6	7.6 ( $p=0.010$ )	5.2	9.7	5.8	0.014*
RMDQ leg (points)	10.4	6.1	7.0	4.9	8.1	6.8	0.084*
NSFI	73.4 ( $p=0.007$ )	8.3	73.8 ( $p=0.004$ )	7.4	66.5 ( $p=0.007$ ) ( $p=0.004$ )	6.9	0.003*
Zung Depression scale (points)	33.4	8.3	32.7	7.4	31.0	4.4	0.844*
HADS anxiety (points)	7.7	4.4	6.6	3.7	7.0	3.4	0.581*
HADS depression (points)	4.5	3.9	4.6	3.6	4.8	2.9	0.966*

n – number of cases; SD – standard deviation; VAS – visual analogue scale; NRS – numerical rating scale; ODI – Oswestry Disability Index; RMDQ – Roland – Morris disability questionnaire; NSFI – Neurospinal Function Index; HADS – Hospital Anxiety and Depression Scale; \* – ANOVA; \*\* – Kruskal-Wallis test.

After completing the course of multidisciplinary rehabilitation programme the results of the discharge data showed that in every single subgroup statistically significant improvement of valued parameters occurred. Comparing the parameters' changes between subgroups, the results data demonstrated existing statistically significant difference in lumbosacral nerve roots irritation sign ( $p < 0.049$ ), assessed by straight leg raising test, and disability level caused by low back pain ( $p < 0.005$ ), measured by Roland – Morris Disability Questionnaire (Table 7). The data analysis revealed the tendency to greater improvement of most of the valued parameters in the subgroups, where the multidisciplinary rehabilitation programme was supplemented by additional dynamic low back structures traction methods, performed in water, whether exercises in pool or underwater traction although the most of parameters changes did not differ significantly between the subgroups ( $p > 0,05$ ).

**Table 7. Comparison of basic patients' evaluation parameters' changes after rehabilitation in different low back traction methods subgroups of multidisciplinary rehabilitation programme**

Parameters changes	Subgroup I-A (traction exercises in pool) n = 31		Subgroup I-B (underwater traction) n = 31		Subgroup I-C (motorised traction on couch) n = 22		p*value
	Change Mean	SD	Change Mean	SD	Change Mean	SD	
VAS low back (mm)	21.6	22.4	22.6	19.2	15.3	16.9	0.377*
VAS leg (mm)	22.6	18.2	24.3	22.0	11.3	19.3	0.051*
NRS low back in rest (points)	1.8	1.7	1.7	1.6	1.3	1.6	0.539**
NRS low back in motion (points)	2.3	2.4	2.3	1.7	1.8	2.0	0.599**
NRS leg in rest (points)	1.9	2.3	1.8	2.0	1.1	1.3	0.185**
NRS leg in motion (points)	2.7	2.3	2.6	1.8	1.4	1.8	<b>0.046**</b>
Fingertip-floor distance (cm)	7.7	7.2	9.9	6.8	7.5	8.0	0.367*
Modified Schober test (cm)	-0.8	2.1	-1.0	0.7	0.0	4.4	0.360*
Straight leg raising test (°)	-19.9	14.5	-21.2	9.5	-14.5	9.7	<b>0.049*</b>
ODI (%)	16.4	11.7	17.0	11.6	11.5	11.8	0.208*
RMDQ low back (points)	5.6 (p = 0.035)	4.5	3.2 (p = 0.035)	3.3	2.3 (p = 0.007)	3.2	<b>0.005*</b>
RMDQ leg (points)	4.4	4.5	3.0	3.2	1.9	3.7	0.058*
NSFI	-2.5	10.7	-2.7	8.0	-4.8	8.3	0.676*

n – number of cases; SD – standard deviation; VAS – visual analogue scale; NRS – numerical rating scale; ODI – Oswestry Disability Index; RMDQ – Roland – Morris disability questionnaire; NSFI – Neurospinal Function Index; \* – ANOVA; \*\* - Kruskal-Wallis test.

Psychoemotional patients' status tests' results showed significantly better improvement in subgroups with additional dynamic low back structures traction method

performed in water (Table 8) as well as the most of the other valued parameters, presented in the table above.

**Table 8. Emotional characteristics changes during the course of rehabilitation programme in different subgroups of multidisciplinary rehabilitation**

Emotional characteristics	Subgroup I-A (traction exercises in pool) n = 31			Subgroup I-B (underwater traction) n = 31			Subgroup I-C (motorised traction on couch) n = 22		
	Arrival mean (SD)	Discharge mean (SD)	p* value	Arrival mean (SD)	Discharge mean (SD)	p* value	Arrival mean (SD)	Discharge mean (SD)	p* value
Zung Depression scale (points)	33.4 (8.0)	31.5 (5.5)	0.027	32.7 (8.5)	28.8 (6.0)	0.019	31.0 (4.4)	29.4 (6.4)	0.405
HADS anxiety (points)	7.7 (4.4)	6.5 (3.7)	0.005	6.6 (3.7)	5.3 (2.7)	0.015	7.0 (3.4)	5.8 (3.5)	0.319
HADS depression (points)	4.5 (3.9)	3.8 (3.6)	0.048	4.6 (3.6)	3.3 (2.8)	0.053	4.8 (2.9)	3.4 (3.0)	0.034

n – number of cases; SD – standard deviation; HADS – Hospital Anxiety and Depression Scale; \* – paired samples t-test or Wilcoxon signed-rank test.

According to the results of the study active low back traction methods performed in water in an average during the sub-acute pain stage are more effective than passive low back traction for patients with disc related lumbosacral radiculopathy with respect to patients’ pain intensity, clinical signs, functional and psychoemotional status.

4. Results of the analysis of functional status changes and experienced pain duration dependence during the course of different outpatient rehabilitation programmes in patients with disc related lumbosacral radiculopathy.

Analysing the data of multidisciplinary rehabilitation programme, the patients of it were divided according to the experienced pain duration to the three subgroups: acute pain, sub-acute pain and chronic pain patients’ subgroups. Patients’ baseline general characteristics are reported in table 9. There was not significant difference between these three subgroup patients observed.

**Table 9. Baseline general characteristics of the multidisciplinary rehabilitation patients in subgroups according to pain duration**

Baseline general characteristics	Acute pain subgroup n = 31		Sub-acute pain subgroup n = 30		Chronic pain subgroup n = 23		p value
	Mean	SD	Mean	SD	Mean	SD	
Age (years)	47.5	12.3	46.6	11.1	45.2	9.2	0.760*
Gender							0.967**

Males, n (%)	13 (41.9)		12 (40.0)		10 (43.5)		
Females, n (%)	18 (58.1)		18 (60.0)		13 (56.5)		
Height (cm)	168.9	8.7	169.1	10.8	170.0	9.5	0.915*
Weight (kg)	80.2	10.0	79.6	12.6	80.7	15.0	0.949*
BMI (kg/m <sup>2</sup> )	28.2	4.2	27.8	3.7	27.9	4.5	0.917*

n – number of cases; SD – standard deviation; BMI – body mass index; \* – ANOVA; \*\* – Chi-Square test.

The analysis of initial patients' evaluation data revealed that patients in all three different pain duration subgroups did not statistically differ ( $p > 0.05$ ) before starting the multidisciplinary rehabilitation programme (Table 10). However the tendency for slightly more severe disability level, measured by all used functional abilities tests, was observed in acute and sub-acute pain subgroups as well as the tendency for higher levels of anxiety and depression in chronic pain subgroup.

**Table 10. Pre-rehabilitation values of basic patients' evaluation parameters of multidisciplinary rehabilitation programme group in subgroups according to pain duration**

Parameters on arrival	Acute pain subgroup n = 31		Sub-acute pain subgroup n = 30		Chronic pain subgroup n = 23		p value
	Mean	SD	Mean	SD	Mean	SD	
VAS low back (mm)	41.1	29.2	51.1	20.6	41.0	22.8	0.162*
VAS leg (mm)	40.8	28.2	42.3	23.3	40.2	27.1	0.954*
NRS low back in rest (points)	3.3	2.6	4.3	1.6	3.8	2.5	0.104**
NRS low back in motion (points)	4.5	2.8	5.9	1.8	4.7	2.3	0.051**
NRS leg in rest (points)	3.1	2.5	3.5	2.1	3.8	2.7	0.615**
NRS leg in motion (points)	4.7	2.7	5.1	2.3	4.9	2.7	0.836**
Fingertip-floor distance (cm)	17.1	15.2	15.5	12.9	14.5	11.4	0.766*
Modified Schober test (cm)	21.0	3.9	21.7	1.4	21.7	1.5	0.449*
Straight leg raising test (°)	65.2	16.4	69.9	15.8	71.1	16.3	0.347*
ODI (%)	24.4	15.9	27.6	14.4	23.2	17.6	0.563*
RMDQ low back (points)	6.3	6.0	5.9	4.5	4.9	4.2	0.568*
RMDQ leg (points)	6.3	5.8	4.8	5.8	4.7	4.9	0.501*
NSFI	74.7	8.6	74.3	6.6	75.4	9.3	0.906*
Zung Depression scale (points)	33.4	7.2	33.1	7.7	36.0	7.6	0.839*
HADS anxiety (points)	6.9	3.8	6.4	3.7	8.2	4.1	0.291**
HADS depression (points)	4.7	3.3	4.0	3.6	5.4	3.8	0.460**

n – number of cases; SD – standard deviation; VAS – visual analogue scale; NRS – numerical rating scale; ODI – Oswestry Disability Index; RMDQ – Roland – Morris disability questionnaire; NSFI – Neurospinal Function Index; HADS – Hospital Anxiety and Depression Scale; \* – ANOVA; \*\* – Kruskal-Wallis test.

Completing the course of multidisciplinary rehabilitation programme the discharge results revealed that the most of the parameters significantly improved in all three different pain duration subgroups themselves, however there was not significant difference observed comparing the mean changes of the parameters, occurred during the course of rehabilitation, between the three subgroups (Table 11), except for established significantly better

functional patients' abilities, measured by Oswestry Disability Index ( $p=0.021$ ), in acute pain subgroup than in sub-acute and chronic pain subgroups.

**Table 11. Comparison of basic patients' evaluation parameters' changes after multidisciplinary rehabilitation in subgroups according to pain duration**

Parameters changes	Acute pain subgroup n = 31		Sub-acute pain subgroup n = 30		Chronic pain subgroup n = 23		p value
	Change Mean	SD	Change Mean	SD	Change Mean	SD	
VAS low back (mm)	19.4	16.4	24.7	24.9	15.9	16.2	0.269*
VAS leg (mm)	19.8	17.5	22.5	26.9	18.0	13.7	0.720*
NRS low back in rest (points)	1.5	1.2	1.8	2.1	1.7	1.4	0.665**
NRS low back in motion (points)	2.1	1.5	2.7	2.5	1.6	1.9	0.131**
NRS leg in rest (points)	1.6	1.6	1.7	2.4	1.6	1.8	0.971**
NRS leg in motion (points)	2.3	1.7	2.5	2.6	2.2	1.7	0.828**
Fingertip-floor distance (cm)	9.5	8.7	7.8	6.2	7.8	6.6	0.573*
Modified Schober test (cm)	-0.4	3.8	-0.8	2.0	-0.9	0.8	0.758*
Straight leg raising test (°)	-19.6	11.5	-18.3	11.4	-19.0	13.3	0.904*
ODI (%)	20.0 (p=0.040) (p=0.050)	11.1	12.8 (p=0.040)	11.6	12.5 (p=0.050)	11.4	<b>0.021*</b>
RMDI low back (points)	3.9	3.6	4.6	4.8	2.8	3.1	0.258*
RMDI leg (points)	3.2	3.4	3.2	5.0	3.3	3.1	0.985*
NSFI	-3.4	10.6	-2.6	8.0	-3.4	8.2	0.940*

n – number of cases; SD – standard deviation; VAS – visual analogue scale; NRS – numerical rating scale; ODI – Oswestry Disability Index; RMDQ – Roland – Morris disability questionnaire; NSFI – Neurospinal Function Index; \* – ANOVA; \*\* - Kruskal-Wallis test.

Comparing the main evaluated parameters' changes that occur completing the course of rehabilitation in acute pain patients, due to disc related lumbosacral radiculopathy participating in different outpatient rehabilitation programmes such as multidisciplinary and non-multidisciplinary programmes, we found that multidisciplinary rehabilitation programme applied during the acute pain is significantly more effective in reducing lumbosacral nerve root irritation signs ( $p=0.014$ ) and improving patient's functioning ( $p=0.018$ ) that is represented in Table12.

**Table 12. Comparison of basic acute pain patients' evaluation parameters' changes after rehabilitation in groups of different outpatient rehabilitation programmes**

Parameters changes	Acute pain Group I (MRP) n = 31		Acute pain Group II (NMRP) n=25		p value
	Change Mean	SD	Change Mean	SD	
VAS low back (mm)	19.4	16.4	19.9	20.7	0.930*
VAS leg (mm)	19.8	17.5	11.6	19.7	0.171*
NRS low back in rest (points)	1.5	1.2	1.5	2.6	0.939**

NRS low back in motion (points)	2.1	1.5	1.9	2.6	0.714**
NRS leg in rest (points)	1.6	1.6	1.4	1.9	0.717**
NRS leg in motion (points)	2.3	1.7	2.1	2.1	0.701**
Fingertip-floor distance (cm)	9.5	8.7	9.1	11.9	0.875*
Modified Schober test (cm)	-0.4	3.8	-1.2	1.3	0.344*
Straight leg raising test (°)	-19.6	11.5	-10.6	14.3	<b>0.014*</b>
ODI (%)	20.0	11.1	10.5	15.8	<b>0.018*</b>
RMDQ low back (points)	3.9	3.6	3.6	4.6	0.790*
RMDQ leg (points)	3.2	3.4	1.8	3.6	0.188*

MRP – multidisciplinary rehabilitation programme; NMRP – non-multidisciplinary rehabilitation programme;

n – number of cases; SD – standard deviation; VAS – visual analogue scale; NRS – numerical rating scale;

ODI – Oswestry Disability Index; RMDQ – Roland – Morris disability questionnaire;\* – independent samples t-test;

\*\* – Mann – Whitney *U* test.

According to the results of the study it can be assumed that the use of multidisciplinary rehabilitation programme during the acute pain is effective in improving neural tension sign, functional patients' status and so, reasoned.

##### 5. Results of the correlations' between functional status and other parameters and characteristics analysis in disc related lumbosacral radiculopathy patients.

Accomplished correlation analysis of variables revealed that patients' functional status values, measured by Oswestry Disability Index and Roland – Morris Disability Questionnaire on discharge have moderate correlation with patient's experienced pain intensity and physical assessment parameters ( $p < 0.01$ ) and weak correlation with patient's age ( $p < 0.01$ ). Good correlation from moderate to strong was observed between all functional status tests themselves ( $p = 0.000$ ) (Table 13). Analysing possible correlation between computerised multidimensional technology „The Insight Subluxation Station“ established single overall quantitative measure – NeuroSpinal Function Index (NSFI) and other patients' characteristics and parameters, evaluated in this study, statistically reliable correlations were not determined.

**Table 13 Functional status parameters on discharge correlation with other patients' characteristics and parameters**

Characteristics or parameter	ODI r	RMDQ(low back) r	RMDQ (leg) r
Gender	sn	sn	sn
Age	0.225 ( $p = 0.039$ )	sn	0.364 ( $p = 0.001$ )
Body mass index	sn	sn	sn
Pain duration	sn	sn	sn
VAS low back <b>arrival</b>	0.452 ( $p = 0.000$ )	0.499 ( $p = 0.000$ )	sn
VAS low back discharge	0.668 ( $p = 0.000$ )	0.706 ( $p = 0.000$ )	0.416 ( $p = 0.000$ )
VAS leg <b>arrival</b>	0.492 ( $p = 0.000$ )	0.416 ( $p = 0.000$ )	0.611 ( $p = 0.000$ )



VAS leg discharge	0.668 (p=0.000)	0.492 (p=0.000)	0.748 (p=0.000)
Fingertip-floor distance <b>arrival</b>	0.469 (p=0.000)	0.411 (p=0.000)	0.304 (p=0.005)
Fingertip-floor distance discharge	0.582 (p=0.000)	0.500 (p=0.000)	0.438 (p=0.000)
Modified Schober test <b>arrival</b>	-0.241 (p=0.027)	-0.299 (p=0.006)	sn
Modified Schober test discharge	sn	sn	-0.242 (p=0.026)
Straight leg raising test <b>arrival</b>	-0.374 (p=0.000)	-0.273 (p=0.000)	-0.367 (p=0.001)
Straight leg raising test discharge	-0.602 (p=0.000)	-0.481 (p=0.000)	-0.480 (p=0.000)
ODI <b>arrival</b>	0.711 (p=0.000)	0.553 (p=0.000)	0.586 (p=0.000)
ODI discharge		0.740 (p=0.000)	0.668 (p=0.000)
RMDQ (low back) <b>arrival</b>	0.600 (p=0.000)	0.709 (p=0.000)	0.473 (p=0.000)
RMDQ (low back) discharge	0.740 (p=0.000)		0.631 (p=0.000)
RMDQ (leg) <b>arrival</b>	0.509 (p=0.000)	0.509 (p=0.000)	0.771 (p=0.000)
RMDQ (leg) discharge	0.668 (p=0.000)	0.631 (p=0.000)	

r- Pearson correlation coefficient; sn –statistically not significant; VAS – visual analogue scale; ODI – Oswestry Disability Index; RMDQ – Roland – Morris Disability Questionnaire.

On the base of performed linear regression analysis of variables mathematical prediction models were created for the probable values of pain intensity in leg, fingertip – floor distance, straight leg raising test and Oswestry Disability Index in order to foresee the likely patient’s results after completing the course of 14 days Monday to Friday spent in therapies within the multidisciplinary rehabilitation programme:

$$\text{VAS leg (after MR programme)} = -5.779 + 0.539*\text{age} + 0.755*\text{ODI (before MR)},$$

here: VAS – visual analogue scale, MR – multidisciplinary rehabilitation, ODI – Oswestry Disability Index, (-)5.779 –constant, 0.539 and 0.755 – linear regression coefficients;

$$\text{FFD (after MR programme)} = 15.924 + 0.295*\text{ODI (before MR)} - 0.319*\text{SLR (before MR)},$$

here: FFD – fingertip – floor distance, MR – multidisciplinary rehabilitation, ODI – Oswestry Disability Index, SLR – straight leg raising, 15.924 – constant, 0.295 and (-)0.319 – linear regression coefficients;

$$\text{SLR test (after MR programme)} = 90.458 - 0.202*\text{VAS leg (before MR)} - 0.585*\text{FFD (before MR)},$$

here: SLR – straight leg raising, MR – multidisciplinary rehabilitation, VAS – visual analogue scale, FFD – fingertip – floor distance, 90.458 – constant, (-)0.202 and (-)0.585 – linear regression coefficients;

$$\text{ODI (after MR programme)} = 1.995 + 0.146*\text{VAS low back (before MR)} + 0.165*\text{VAS leg (before MR)} + 0.278*\text{FFD (before MR)},$$

here: ODI – Oswestry Disability Index, MR – multidisciplinary rehabilitation, VAS – visual analogue scale, FFD – fingertip – floor distance, 1.995 –constant, 0.146, 0.165 and 0.278 – linear regression coefficients.

## CONCLUSIONS

1. The main features of patients' contingent due to disc related lumbosacral radiculopathy attending different rehabilitation programmes provided in urban outpatient rehabilitation setting are working, young and middle-aged, employed persons with higher level of education, predominating female patients.
2. Outpatient rehabilitation programmes whether multidisciplinary or non-multidisciplinary are effective for patients with disc related lumbosacral radiculopathy statistically significantly reducing pain intensity both in leg and low back, while multidisciplinary rehabilitation programme is significantly more effective reducing lumbosacral nerves roots irritation signs and functional patients' status.
3. Multidisciplinary rehabilitation programme supplemented by dynamic low back traction performed in water, whether exercises in pool or underwater traction is significantly more effective reducing pain and lumbosacral nerves roots irritation signs, improving functional status in patients with disc related lumbosacral radiculopathy. Multidisciplinary rehabilitation programme with dynamic low back traction performed in water significantly improve psychoemotional patients' status.
4. Multidisciplinary rehabilitation programme designed for patients with disc related lumbosacral radiculopathy applied during the acute pain is significantly more effective improving patients' functional status, than the same programme applied in sub-acute or chronic pain, and is more effective then non-multidisciplinary programme applied during the acute pain.
5. Patients' functional status values on discharge have statistically significant moderate correlations with patients' experienced pain intensity and physical assessment parameters on arrival and weak correlation with patients' age. Estimated mathematical prediction formulae allow forecasting the changes in patients' experienced pain intensity, physical assessment

parameters and functional status during the course of multidisciplinary rehabilitation due to disc related lumbosacral radiculopathy.

## **PRACTICAL RECOMMENDATIONS**

1. In order to induce earlier pain intensity reduction, functional and psychoemotional status improvement with higher probability of patients returning to their former social activity level, including return-to-work and leisure hobbies, it is crucial for patients with disc related lumbosacral radiculopathy to be directed for the early course of multidisciplinary rehabilitation programme.
2. Any type of outpatient rehabilitation programme designed for patients with disc related lumbosacral radiculopathy, especially when planning low back traction, have to be individualised not only according existing precautions and contraindications to the particular low back traction method, but also considering patient's experienced pain duration, radiological confirmed intervertebral disc herniation direction and patient's emotional and psychosocial status.
3. To predict patients' with disc related lumbosacral radiculopathy immediate results after completing the course of multidisciplinary rehabilitation lasting of 18 consecutive calendar days, of which 14 spent in therapies of the programme, it is recommended to use our suggested predictive formulae for pain intensity, spinal mobility, neural tension sign and functional status, according visual analogue scale, fingertip – floor distance, straight leg raising test and Oswestry Disability Index.

## **LIST OF PUBLICATIONS**

### **Reviewed publisher papers:**

1. **S. Lenickienė**, A. Juocevičius, V. Skvreckaitė. Effectiveness of the Outpatient Comprehensive Rehabilitation Programme. *Gerontologija* 2010; XI (4):211-218, (article in Lithuanian).
2. **S. Lenickienė**, A. Juocevičius, D. Merkytė. Outpatient Comprehensive Rehabilitation Programme's, performed in the Centre of the Rehabilitation, Physical and Sports

Medicine, Vilnius University Hospital Santariškių Klinikos during 2006–2007, Structure. Gerontologija 2009; X(3):161-167, (article in Lithuanian).

#### **Other publications and posters:**

1. **S. Lenickienė**. PRM and patients suffering from low back pain with lumbosacral radiculopathy. UEMS PRM Section & Board, Clinical Affairs Committee, 2010 11 20, Programme of care reviewed by 3 independent reviewers, pp. 1-31, available from: <http://www.euro-prm.org/en/clinical-affairs-news/e-book-on-qoprms-care/accredited-programme/49-n003-prm-pc-for-patients-with-low-back-pain-and-lombo-sacral-radiculopathy.html>.
2. **S. Lenickienė**. PRM and patients suffering from low back pain with lumbosacral radiculopathy. Livre des Resumes 25e Congres de Medecine Physique et de Readaptation 14, 15 et 16 Octobre 2010, Marseille (Abstract Book of 25th Annual Congress of Physical and Rehabilitation Medicine), p.65.
3. Juocevičius A, **Lenickienė S**, Skverekaitė V. Need for out-patient comprehensive rehabilitation: epidemiological data study. Abstracts 16<sup>th</sup> European Congress of Physical and rehabilitation medicine, June 3-6, 2008, Brugge, Belgium. Journal of Rehabilitation Medicine 2008; 47: 274.
4. **S. Lenickienė**, A. Juocevičius, V. Skverekaitė. Need for out-patient comprehensive rehabilitation: epidemiological data study. Final Program and Abstract Book 5<sup>th</sup> International Baltic Congress of Sports Medicine (BASM) 7-8 December, 2007, Vilnius, Lithuania, pp.29-30

#### **Oral presentations:**

1. Invited presentation: **S. Lenickienė**. Programme of Care „PRM and Patients with Low Back Pain Complicated by Radiculopathy“ in Vilnius University Hospital Santariškių Klinikos. PRM Congress SOFMER, Marseille, France, 2010 October 14.
2. **S. Lenickienė**, A. Juocevičius. Treatment and rehabilitation of low back pain. Evidence based practice. Vilnius University Faculty of Medicine, the Institute of the Rehabilitation, Sport Medicine and Nursing, Vilnius University Hospital Santariškių

klinikos, the Centre of the Rehabilitation, Physical and Sport Medicine conference „The relevant subjects of physical medicine and rehabilitation“. Panevėžys, Lithuania, 2009 April 24.

3. **S. Lenickienė**. Contemporary methods of complex spinal evaluation. Vilnius University Faculty of Medicine, the Institute of the Rehabilitation, Sport Medicine and Nursing, Vilnius University Hospital Santariškių klinikos, the Centre of the Rehabilitation, Physical and Sport Medicine conference „Physical medicine and rehabilitation development tendency in Europe“. Vilnius, Lithuania, 2008 November 21-22.

## **ABOUT THE AUTHOR**

**Svetlana Lenickienė**

**Date of Birth** 18-07-1972

**Current Employment** Vilnius University Hospital Santariškių klinikos, Rehabilitation, Physical and Sport Medicine Center, Outpatient Rehabilitation Department, Physical Medicine and Rehabilitation physician.

**Education** **2007-2011** Doctoral Studies at the Institute of the Rehabilitation, Sport Medicine and Nursing, Faculty of Medicine, Vilnius University;  
**1996-1998** Vilnius University Faculty of Medicine, Physical Medicine and Rehabilitation Secondary Residency;  
**1995 – 1996** Vilnius University Faculty of Medicine, Primary Residency;  
**1989 –1995** Vilnius University Faculty of Medicine, Study programme – medicine.

**Membership** Lithuanian Society of Physical Medicine and Rehabilitation Physicians.

**Other** Certificate of the European Standard in Physical and Rehabilitation Medicine (Certificate No. 2014), 2008 January 10 The European Board of Physical and Rehabilitation Medicine.

**E-mail** svetlana.lenickiene@santa.lt

## REZIUMĖ

Nugaros apatinės dalies skausmai bei su jais susiję sveikatos sutrikimai yra aktuali šių dienų sveikatos priežiūros problema. Teigiama, kad visame pasaulyje stebima su nugaros apatinės dalies skausmais susijusių darbingumo netekimo ir negalios eksponentinio didėjimo tendencija, kas leidžia manyti, kad tai yra labai aktuali sveikatos priežiūros problema, reikalaujanti konstruktyvaus sprendimo (Waddell 2004, Taimela ir kt., 2004). Deja, stebima ydinga tendencija: kuo ilgiau dirbantysis nedirba dėl nugaros apatinės dalies skausmų, tuo mažesnė tikimybė jam grįžti į darbą. Po 6 mėnesių nedarbingumo laikotarpio į darbą grįžta mažiau negu 50 procentų sergančiųjų, o po 2 metų nebuvimo darbe laikotarpio galimybė sugrįžti į darbą yra minimali (Woolf, Pfleger, 2003). Šie rodikliai, be abejonės, daro didžiulę socioekonominę įtaką visai visuomenei (Woolf, Pfleger, 2003, Taimela ir kt., 2004), nes netiesioginės išlaidos dėl nepagamintos produkcijos, išmokamų socialinių pašalpų, 7-8 kartus viršija tiesiogines medicinines išlaidas, skirtas nugaros apatinės dalies skausmų problemai spręsti (Maniadakis, Gray, 2000; Walker ir kt., 2003). Daugiafaktorinis ir sudėtingas nugaros apatinės dalies skausmų atsiradimo ir vystymosi procesas bei su nugaros apatinės dalies patologija susijusios darbingumo sumažėjimo ir negalios problemos reikalauja kompleksinio jų sprendimo, atsižvelgiant į biopsichosocialinį ligos modelį (Waddell, 1987; Stanos ir kt., 2007). Siekiant padėti pacientams, sergantiems nugaros apatinės dalies skausmais ir su jais susijusiais sindromais, įveikti įvairius – tiek medicininius, tiek psichologinius, tiek socialinius barjerus, esančius jų sveikimo kelyje, tikslinga taikyti daugiadisciplininę reabilitaciją. Guzman ir bendraautorai (2001) apibūdino daugiadisciplininę biopsichosocialinę reabilitaciją kaip reabilitacijos programos struktūroje naudojamų fizinių reabilitacijos aspektų ir bent vieno iš kitų reabilitacijos aspektų, tokių kaip: psichologinis arba socialinis, arba profesinis, derinį. Literatūroje plačiai aprašoma daugiadisciplininės kompleksinės reabilitacijos įtaka pacientų rezultatams tiek dėl skausmo sumažėjimo, tiek dėl veiklos ir aktyvumo lygio apribojimų sumažėjimo, tiek dėl grįžimo į darbą, tačiau tik esant *lėtiniams nespecifiniams* nugaros apatinės dalies skausmams. Daugiadisciplininės reabilitacijos taikymo naudingumas esant diskogeninei juosmeninei kryžmens radikulopatijai mokslinėje literatūroje yra nepakankamai nagrinėjamas (Koes ir

kt., 2007; Chou ir kt., 2009). Bart W. Koes su kolegomis (2007) atliktoje klinikinėje apžvalgoje pabrėžė, kad nėra publikuotų klinikinių tyrimų, vertinančių daugiadisciplininės reabilitacijos efektyvumą ir jos įtaką pacientų klinikinės ir funkcinės būklės pokyčiams esant diskogeninei juosmeninei kryžmens radikulopatijai. Taigi diskogeninės juosmeninės kryžmens radikulopatijos efektyvių konservatyvaus nemedikamentinio gydymo priemonių bei efektyvios daugiadisciplininės reabilitacijos programos sudarymo ir taikymo problema lieka neišspręsta ir aktuali.

Atlikto darbo tikslas buvo įvertinti sergančiųjų diskogenine juosmenine kryžmens radikulopatija taikomų skirtingų ambulatorinės reabilitacijos programų turinio ir ligonių patiriamo skausmo, fizinių, funkcinų ir psichoemocinių pokyčių sąsajas.

Darbo metu išanalizuoti 266 pacientų, sergančių diskogenine juosmenine kryžmens radikulopatija, 2006–2011 metais Vilniaus Universiteto ligoninės Santariškių klinikos Reabilitacijos, fizinės ir sporto medicinos centro Ambulatorinės reabilitacijos skyriuje vykdžiusių skirtingo turinio reabilitacijos programas, duomenis. 139 prospektyvinėje tyrimo dalyje dalyvaujantys pacientai atsitiktinės atrankos būdu suskirstyti į dvi grupes: Grupė I ir Grupė II, besiskiriančias pagal taikomą ambulatorinės reabilitacijos programą. Grupės I pacientai (n = 90) vykdė *kompleksinės daugiadisciplininės reabilitacijos programą*. Grupės II (n = 60) pacientai vykdė *nekompleksiškai taikomų reabilitacijos priemonių programą*. Pagal parengtą tyrimo anketą buvo vertinama kiekvieno (-os) paciento (-ės): demografiniai duomenys (lytis, amžius); socialiniai duomenys (įgytas išsilavinimas, socialinė padėtis, dirbamo darbo ir/ar gyvenimo būdas, šeimtinė padėtis, dėl dabartinės ligos turimo laikino nedarbingumo pažymėjimo trukmė); tam tikri antropometriniai duomenys (ūgis, svoris, kūno masės indeksas); bendra nugaros apatinės dalies skausmų trukmė; dabartinio skausmo trukmė; esamos tarpšlankstelinio disko patologijos lokalizacija ir kryptis; skausmo intensyvumas (vizualinė analogijos skalė, skaitmeninė skalė); neurologinė būklė (ištiestos kojos pakėlimo testas, kojų paviršiniai jutimai, kojų raumenų jėga bei sausgysliniai refleksai); stuburo juosmeninės kryžmens dalies paslankumas, vadinamasis spinalinis mobilumas (pirštų ir grindų atstumas, modifikuotas Šober'o testas); funkcinė būklė (Oswestry negalios indeksas, Roland ir Morris negalios klausimynas). Papildomai kompleksinės

daugiadisciplininės reabilitacijos programos pacientų buvo vertinama: stuburo ir paravertebraliųjų audinių funkcinė būklė, naudojant kompiuterizuotą įrangą „The Insight Subluxation Station“ (JAV), bei emocinė būklė, vertinant nerimo ir depresijos lygius, naudojant Ligoninės nerimo ir depresijos skalę bei Zung'o depresijos skalę.

Apibendrinant atlikto darbo rezultatus nustatyta, kad ambulatorinės reabilitacijos programos dėl diskogeninės juosmeninės kryžmens radikulopatijos vykdančių pacientų grupės didesnę dalį sudaro jauno ir vidutinio amžiaus dirbantys pacientai, turintys aukštesnį už vidurinį išsilavinimą; bendroje pacientų struktūroje vyraujant moterims. Ambulatorinės reabilitacijos programos, taikomos sergantiesiems diskogenine juosmenine kryžmens radikulopatija, statistiškai reikšmingai sumažina pacientų patiriamo skausmo intensyvumą, pagerina klinikinius parametrus ir funkcinę būklę. Kompleksinės daugiadisciplininės reabilitacijos programa reikšmingiau negu nekompleksiškai taikomų reabilitacijos priemonių programa sumažina nugarinių nervų šaknelių tempimo simptomatiką ir pagerina funkcinę būklę. Darbo rezultatai parodė, kad nugaros apatinės dalies tempimo aktyvios metodikos, atliekamos baseine ir vertikaloje vonioje, reikšmingiau negu nugaros apatinės dalies tempimo pasyvi metodika sumažina sergančiųjų diskogenine juosmenine kryžmens radikulopatija patiriamo skausmo intensyvumą, sumažina nugarinių nervų šaknelių tempimo simptomus bei pagerina funkcinę būklę. Kompleksinės daugiadisciplininės reabilitacijos programa, kurios sudėtyje taikomos aktyvios nugaros apatinės dalies tempimo metodikos vandenyje, patikimai pagerina pacientų psichoemocinę būklę. Remiantis darbo rezultatais nustatyta, kompleksinė daugiadisciplininė reabilitacijos programa, pradėta taikyti ūmaus skausmo stadijoje, reikšmingiau pagerina pacientų funkcinę būklę, lyginant su šia programa, taikoma poūmio ar lėtinio skausmo stadijose. Ūmaus skausmo stadijoje taikoma kompleksinės daugiadisciplininės reabilitacijos programa yra efektyvesnė už nekompleksiškai taikomų reabilitacijos priemonių programą, reikšmingiau pagerinant sergančiųjų klinikinius parametrus ir funkcinę būklę. Pacientų funkcinė būklė kompleksinės daugiadisciplininės reabilitacijos programos vykdymo pabaigoje turi vidutinius koreliacijos ryšius su skausmo intensyvumu ir klinikiniais parametrais, nustatytais pradedant programą, bei silpną koreliacijos ryšį su pacientų amžiumi. Sudarytos regresijos lygtys leidžia



prognozuoti skausmo intensyvumo, klinikinių parametų ir funkcinės būklės pokyčius kompleksinės daugiadisciplinės reabilitacijos, taikomos sergantiesiems diskogenine juosmenine kryžmens radikulopatija, metu.