

# Influence of Early Intensive Rehabilitation on Functional Mobility after Low Back Surgery

Tsvetelina Bizheva<sup>1</sup>, Danijela Lubenova<sup>1</sup>, Ivan Maznev<sup>2</sup>, Kristin Grigorova-Petrova<sup>1</sup>, Antoaneta Dimitrova<sup>1</sup>, Danche Vasileva<sup>3\*</sup>, Milena Nikolova<sup>1</sup>

<sup>1</sup>Department of Kinesitherapy and Rehabilitation, National Sports Academy "V. Levski", Sofia, Bulgaria; <sup>2</sup>Department of Sports Medicine, National Sports Academy "V. Levski", Sofia, Bulgaria; <sup>3</sup>Faculty of Medical Sciences, Goce Delchev University, Shtip, Republic of Macedonia

## Abstract

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\***Correspondence:** Assoc. Prof. Danche Vasileva, PhD. Goce Delchev University, Faculty of Medical Sciences, 2000 Shtip, Republic of Macedonia. E-mail: [danche.vasileva@ugd.edu.mk](mailto:danche.vasileva@ugd.edu.mk)

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**AIM:** The research aims to determine the influence of early goal-oriented physical therapy program in combination with educational booklet and standard physical therapy without written instructions on functional mobility outcomes in patients after low back surgery.

**MATERIAL AND METHODS:** Thirty patients with similar functional impairments were randomly divided into two groups, a control group (CG n = 10) and an experimental group (EG n = 20). The outcome measures include time to move from lying to sitting position, the TUG test and the 6-meter walk test. Rehabilitation program includes daily physical therapy with mild to moderate intensity, achieving sitting position and education sessions how to perform activities of daily living (ADL) from the first day after surgery.

**RESULTS:** There was a significant improvement from baseline in two groups for all performed tests ( $p < 0.001$ ). Statistical significant differences between two groups for transfers in bed on discharge ( $p < 0.05$ ), in one month ( $p < 0.01$ ) and for TUG in one month ( $p < 0.05$ ) were found.

**CONCLUSION:** The study revealed that early rehabilitation program consists of therapeutic exercises and written educational booklet after low back surgery improves transfer abilities and basic activities in one month.

## Introduction

Degenerative spinal diseases are common disorders and they are a significant social problem. Spine surgery due to degenerative diseases is associated with prolonged hospital stay [1].

Low back pain is second to upper respiratory problems as a symptom-related reason for visits to a physician. There are wide variations in care, a fact that suggests there is professional uncertainty about the optimal approach. Magnetic resonance imaging has come to be widely used, the roles of exercise and bed rest have been clarified, and more information has been gained from clinical trials [2]. The integrated program of early rehabilitation improved the outcome and shortened the hospital stay without more

complications, pain or dissatisfaction.

The aim of the research is to compare the influence of a physical therapy program that combines active exercises with written instructions (educational booklet) about activities of daily living (ADLs) based on guideline recommendations, or oral information on functional mobility in patients after low back surgery in one month after an operation.

## Material and Methods

Thirty patients, voluntarily attended and were treated in the Department of Neurosurgery at University Hospital Sofamed - Sofia was randomly divided into two groups, control group (CG n = 10) and

experimental group (EG n = 20). All patients had similar impairments and functional limitations. The mean age of EG is 55.9 ± 13.8, of CG is 58.3 ± 9.5. The mean length of stay for EG is 3.9 ± 0.9; for CG is 3.6 ± 0.7 days. There were no significant differences in the age and length of hospital stay in both groups.

**Table 1: Overview of the physical program**

Steps	Goals	Activities
Preventing complications	Increase respiratory capacity -improvement of peripheral circulation	Breathing exercises/ combined with movement of the upper limbs, diaphragmatic breathing Abdominal drawing in manoeuvre
Take a sitting position	Self-moving in bed	Transfers and bed mobility exercises for upper and lower limbs in bed
Strengthening the spinal muscles	To increase the strength of muscles forming lumbar muscle corset.	abdominal exercises, isometric exercises, PNF
Training in walking	Improve posture Improve gait	Exercises for posture Training of gait
Patient's education in ADL	Prevention and long-term self-care for the back	Home exercise program (HEP) Healthy posture Balanced position of the spine and extremities

Outcome measures include transfer from lying to sitting position, Timed Up and Go (TUG) test [3] and walking speed for a six-meter walk test [4]. Transfer time was assessed by instructions which were given to the patient to sit up with legs down. Time for independent sitting without touching the bed with hands was measured. All the tests were measured three times, on the first day after surgery, on the day of discharge and one month later.

**Table 2: Exercises and Instructions**

Exercises	Instructions	Time
Exercises in supine Neurodynamic glides Pivot does not twist with neutral spine with all transfers and bed mobility Posture principles for ADL	Training transfers to bed (until the drain is removed),  The physical therapist helps patient to transfer from one position to the next, sit at the side of the bed without rotation (using techniques for convenience).	5-6 min.  2-3 times
Stabilisation exercises in supine-sit -standing with no weight	The first verticalization is with or without a belt according to the intervention.	3-4 times
Strengthening the muscles that support the lower back	Without pain	5-10 times
Training in ADL - lifting subjects, footwear, clothing - Golfer's lift and reacher	Patient's education focuses on the acquisition of information and technical skills and transition to self-fulfilling action, which facilitates patients, helping them to make decisions and take appropriate action when changes in their disease or condition [6].	10 min.
Walking to a place in countries of the right and left, Walking back, Skip the subject, Climbing down and up stairs	Reinforcement techniques transfers, sit and walking, training in walking, climbing down and upstairs and pick up the object from the floor [6]. The therapist helps with gait, balance and strengthening of lower and/or upper extremities.	10-15 min.

All patients performed daily physical therapy for 30 minutes with mild to moderate intensity achieving sitting position from the first day after surgery. Proprioceptive neuromuscular facilitation for transfer positions, gait training (Table 1, 2) and an educational booklet with instructions (based on guidelines recommendations) on how to perform exercises and ADLs at home for one month after surgery (Table 3) were given to the patients of EG.

The CG was on the standard physical therapy program and instructions on how to continue exercise at home and to resume daily activities gradually.

**Table 3: Instructions to patients after discharge from hospital**

N	ADL	Instructions
1.	Lying	Put a pillow under knees when lying on the back, and between knees when lying on one side.
2.	Getting up from bed	Sit in and get up from bed by first turning to one side  - lying on the back, bend both legs and place one heel on the other knee
3.	Putting on shoes [6]	- in standing - tread on the shoe rack, or tread with one knee on the floor
4.	Sitting in a chair	During prolonged sitting before you stand up, perform several forward and backwards movements of the pelvis. Do not sit in one place for more than 20 minutes
5.	Getting up from a chair	When getting up from a chair body should bow forward, hands push from the hips. Hands can be used for support in sitting, too. Avoid low and soft armchairs and sofas.
6.	Getting subject [6]	To get subject without reaching or bending, it has to be on the level between hip and shoulder. When you need to take products from the refrigerator or stove, while bending the shoulders, you must slightly outsource back leg back and up, so that the body is not excessive bent.
7.	Lifting	Lifting the weight from the floor is through the squat, keep the weight close to the body
8.	Getting the objects above the head	Getting the objects above the head should not be done with tightening the body, but standing on something that will bring the subject to the level of the head.
9.	Washing dishes [6]	In activities when we lower the upper part of the body, we can carry the pelvis slightly back, with a little step one foot back
10.	Driving a car [6]	Avoid driving at least one week after surgery. While sitting in a car, do the seat back angle greater than 90 degrees. Avoid bending, especially when you get out of the car.
11.	Getting a shower	Place a rubber mat on the floor to avoid sliding. If necessary, lay handles a convenient location to help with getting up from the toilet seat bath
12.	Ironing	Ironing table should be at elbow level, you can use a chair to sit.
13.	Carrying	When carrying purchases, the weight is distributed evenly in both hands

Statistical analysis was performed using SPSS 19.00 for Windows. Independent sample t-test and chi-square test were used to examine the baseline characteristics of two groups for age and gender. Independent and paired sample t-tests were conducted to determine the effect of the intervention on and transfers in bed, TUG and six-meter walk speed. Statistical significance was set at p < 0.05.

## Results

No significant differences in the groups' baseline characteristics were found. There was a significant improvement (Table 4) from baseline in two groups for all tests (p < 0.001). Statistical analysis found no significant differences between the two groups, except for transfers in bed on discharge t (28) = 2.64, p < 0.05, in one month t (28) = 3.44, p < 0.01 and for TUG in one month t (28) = 2.74, p < 0.05.

The walking speed for six meters during hospitalisation improves with 0.2 m/s for EG and CG. The time for transfers starts from 9.1 sec. for both groups and improves to 6.1 sec. for EG and 7.7 sec. for CG. The significant improvement in transfers and TUG in one month was 4.8 sec. and 11.3 sec. for EG.

**Table 4: Outcomes for both groups**

Tests	Group	1 <sup>st</sup> assessment Mean ± SD	2 <sup>nd</sup> assessment Mean ± SD	3 <sup>rd</sup> assessment Mean ± SD
Transfer (sec)	EG	9.1 ± 2.7	6.1 ± 1.7	4.3 ± 0.7
	CG	9.1 ± 1.6	7.7 ± 1.7	5.5 ± 1.2
TUG (sec)	EG	20.1 ± 6.5	14.9 ± 5.3	8.8 ± 2.5
	CG	19.8 ± 6.3	16.5 ± 6.2	11.8 ± 3.5
6 meters walk (m/s)	EG	0.4 ± 0.1	0.6 ± 0.3	1.0 ± 0.3
	CG	0.4 ± 0.2	0.6 ± 0.2	0.8 ± 0.3

SD- standard deviation; EG – experimental group; CG – control group.

## Discussion

The research aims to determine the influence of early goal-oriented physical therapy programs in combination with educational booklets compared to standard physical therapy without written instructions on functional mobility outcomes in patients after low back surgery. There are different views of surgeons in terms of the initial period of rehabilitation after surgery [5]. Seventy percent of surgeons prefer to mobilise their patients out of bed on the very first day after surgery, 20% on day 2 and 10% leave it until the patient feels able [6]. However, recent reviews on rehabilitation following lumbar disc surgery concluded that there was insufficient evidence that rehabilitation, in general, could lead to a faster decrease in pain and disability. The physiotherapy interventions still remain unclear [7]. Despite the lack of evidence, we consider that early physical therapy contributes to a better recovery of the patient and leads to a faster return to normal functional status. All our patients were mobilised as early as possible, according to surgeons' instructions. They took a sitting position immediately on the first day after intervention. Michael R, (2005) describes that on the day after surgery, the patient demonstrated an expected amount of post-operative stiffness, range of motion (ROM) limitations and functional deficits [8]. Therefore, the first thing we demonstrated and explained to the patient was: how to perform movements in bed as in pivoting, not twisting the spine in all transfers and bed mobility. Physical therapy is focused on functional mobility (getting in and out of bed, transfers, and walking). We consider that this contributes to a better recovery of the patients and leads to a faster return to a normal functional state.

In the last few years, the mean hospital stay has reduced from 6.6 days to 2.6 days (2011–2012), which means that the time for training the patients to perform proper ADLs is limited [9]. Since hospitalisation is just a few days, the patients performed the rehabilitation program at home. In our case, the mean hospital stay was 3.8 days. During this period, patients improved their transfer abilities and walking speed, but not sufficient to restore the possibility of normal functional mobility. At discharge,

a significant difference between the two groups only in transfers in bed was achieved, probably due to the short time of hospitalisation. Our research shows that for a better recovery of functional mobility after spinal surgery, patients need at least one month.

The importance of written patient education as an integral component of postoperative rehabilitation is increasing [10]. This indicates the need for developing a program for home practice and self-performing exercises. Our opinion is that a written educational booklet contributed in the restoration of physical activity. The same opinion is shared by other researchers [8, 10-12].

There are many pieces of evidence for the effectiveness of outpatient physiotherapy post first lumbar discectomy [11]. No particular methodology for rehabilitation has proven to be the best yet. Engers A. et al., (2008) compared different types of individual education and did not find significant differences [13]. There is a wide variation in physical therapy practice with respect to proper post-operative management. A home exercise program "HEP" was given by Michael R, (2005) [7]. Leaflets with information about the behaviour after spinal surgery such as "Get Well Soon" [14] and "Your Back Operation" [15] are available on the Internet. McGregor A. et al (2012), considers that the booklet was welcomed by patients and they valued the information [12]. In our "Instructions To Patients After Discharge From Hospital", we have also tried to give the most important trends in the performance of ADLs in a way that is safe for the back and does not cause complications after surgery. Restrictions on lifting, sitting and driving showed considerable inconsistencies within the recommendations given by surgeons [5].

In his study, Danielsen J. et al. (2005) proved that the postoperative disability is reduced at least in the first six months. He recommended intensive, standardised exercise training that ignores the fear of provoking pain and begins four weeks after the surgery [16]. We started training in proper motion and performance of ADLs immediately after surgery. Also, we gave written explanations of the requirements of performance of ADLs, and added to the description, pictures for easy understanding. Thus, patients gained confidence and self-esteem in their movements even before the discharge from the hospital. Care after discharge shows greater variability. Proper implementation of the ADLs and avoiding bending and rotation, lead to faster recovery and increase the independence in daily living [5].

The monitored basic activities (TUG test) demonstrate that until the day of discharge from the hospital, patients still have limited abilities in functional mobility, which were normalised on the first month after surgery. TUG was used in the study of Michael R, (2005) and results showed significant improvements. He discussed that TUG is appropriate

for monitoring the recovery in patients after spinal surgery [8].

In conclusion, the survey revealed that early rehabilitation programs consisting of therapeutic exercises and written educational booklet after low back surgery improved transfer abilities and basic activities in one month.

Further investigations should be made to assure the number of baseline variables which may influence the effectiveness of a physical therapy program and written instructions on functional mobility.

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