Influence of a Kinetotherapy Program on Health Related Quality of Life in Patients with Stroke

Florentina Ligia Furtunescu[1], Brîndușa Ilinca Mitoiu[2*], Dana Galieta Mincă[3], Adriana Sarah Nica[4], Radu Virgil Costea[5]

[1] University of Medicine and Pharmacy Carol Davila - Department Preclinic III - Complementary Sciences, associate professor
[2] University of Medicine and Pharmacy Carol Davila - Department Clinic IX – Medical Rehabilitation, assistant professor,
[3] University of Medicine and Pharmacy Carol Davila - Department Preclinic III - Complementary Sciences, professor
[4] University of Medicine and Pharmacy Carol Davila - Department Clinic IX – Medical Rehabilitation, professor,
[5] University of Medicine and Pharmacy Carol Davila - Department Clinic X - Surgery, associate professor

ABSTRACT

Kinetotherapy programs decrease the deficits and improve the quality of life in patients with stroke, but the access to these programs is quite poor. Our study aimed to measure the benefits in functionality and quality of life gained by patients with stroke following a kinetotherapy in-hospital program. We studied 105 patients with stroke (81% ischemic and 19% hemorrhagic), median age 61 years (min 23, max 82), 55% males, and median duration from the acute event 5 months (min 2; max 45 months). Patients were tested at three moments (admission, discharge, 6 months after discharge) measuring their pain (VAS), spasticity (Ashworth Scale), functional independence (Functional Independence Measure Scale) and quality of life (SF 36). Patients gained significant improvements in pain, functional independence and especially quality of life. Our results underline the importance of access to appropriate rehabilitation therapy for patients with stroke.

KEYWORDS: *functional independence, kinetotherapy programs, quality of life, pain, spasticity.*

1. INTRODUCTION

A stroke, cerebrovascular accident (CVA), cerebrovascular insult (CVI), or brain attack is the loss of brain function due to a disturbance in the blood supply of the brain, consequence to either ischemia or hemorrhage [1]. Around 80% of the strokes are ischemic, meanwhile 15% are hemorrhagic [2]. Ischemic stroke can be caused either by a blood clot or another substance (plaque, fatty material) that travels through the blood stream to a brain artery (the embolic stroke), or a blood clot forms inside an artery that supplies blood to the brain (thrombotic stroke). Both situations lead to an occlusion of blood vessels supplying brain tissue, with consequent deprivation of oxygen and nutrients, neuronal death and irreversible brain injury. Ischemic risk factors include age older than 40 years, heart disease, high blood pressure, smoking, diabetes, high blood cholesterol levels, illegal drug use, recent childbirth, previous history of transient

* Corresponding author. Tel.: +4-021-318-0714; fax: +4-021-318-0714.
E-mail address: brindusailinca@yahoo.com

ischemic attack, inactive lifestyle and lack of exercises, obesity, current or past history of blood clots [3]. Hemorrhagic stroke occurs when a blood vessel suddenly ruptures and blood leaks directly into brain tissue and/or into the clear cerebrospinal fluid that surrounds the brain and fills the ventricles, brain damage being related in this case to the leaked blood which irritates and harms the brain cells. As hemorrhagic risk factors high blood pressure, smoking, illegal drug use (especial cocaine and 'crystal meth'), use of warfarin and other blood thickening drugs should be mentioned [4].

Worldwide, stroke is the third main cause of mortality and morbidity in developing countries (after myocardial infarction and cancer) and the most important reason of long term disability [5]. Every year around 15 million people worldwide suffer a stroke, among which 5 million die and another 5 million remain with a permanent disability, thus affecting profoundly the quality of life for the patient and the family as well [5]. According to American Heart Society, stroke tends to be more common in men (incidence and prevalence rate 33% and 41% respectively, both higher than in females), but more severe in women (1 month case fatality of 24.7% compared with 19.7% in men) [6]. Stroke mortality is three to four times higher in Romania than the EU countries average [7]. The stroke prevalence for Romania is 0,1% for the less than 40 years group of age, 1,8% for the 40-55 years interval, 53% for 55-70 years and 13,9% for higher than 70 years, Romania being situated in top ten of stroke incidence worldwide, with also a higher incidence for primary cerebral hemorrhagic incident [8].

Stroke treatment management relies on correct diagnosis of ischemic or hemorrhagic etiology, followed up by cardiovascular, respiratory and neurological assessment and rehabilitation therapy. Rehabilitation after stroke aims to preserve or improve range of motion, muscle strength, bowel and bladder function, functional and cognitive abilities [9, 10]. To prevent second disabilities and depression, rehabilitation procedures should begin as soon as patients are medically stable [11, 12]. Regaining the ability to get out of bed and to transfer to a chair or a wheelchair safely and independently is extremely important for the patient's psychological and physical well-being [13 - 16]. Gait impairment, spasticity, visual field defects, incoordination and aphasia require specific therapy. For hemiplegia novel treatments include: constraint-induced movement therapy, robotic therapy, partial weight-supported ambulation and total body vibration [17 – 20]. After a stroke, fine coordination may be absent so it is important for patient's recovery to be directed to the occupational therapist [21 – 24]. Given the risen frequency and debilitating consequences of this pathology, physical therapy must be granted intensive attention for the outcome in reintegration management [25, 26]. Although the recognized benefits of the kinetotherapy programs for both functionality and quality of life of the patients with stroke, the access to these programs is quite poor in Romania.

2. AIM

Our study aimed to measure the benefits in functionality and quality of life gained by patients with stroke following a kinetotherapy in-hospital program.

3. METHODS

We performed a prospective study on 105 patients with spastic hemiparesis secondary to stroke, (55% males) admitted in a Rehabilitation Clinic during a 6 months period. Patients followed a personalized rehabilitation program. They were examined at the admittance (T0), at discharge – after two weeks of in-hospital rehabilitation program (T1) and in six months after discharge (T2). We measured pain, spasticity, functional independence and quality of life, using

respectively Visual Analogic Scale (VAS), the modified Ashworth Scale, the Functional Independence Measure Scale (FIM) and SF 36 [27 - 30]. The chronic pain on the affected hemibody was tested at shoulder and knee, in rest and at mobilization. Spasticity was measured at hand's flexors and thigh's adductors on the affected part. The functional independence was tested globally and by motor and cognitive component and for the assessment of quality of life physical (PCS) and mental (MCS) scores of SF-36 were considered.

Principles for therapy: The major pathological problem for our patients was the abnormal command of the nervous impulse, as the motor control was absent or deficient. Usually the patient develops abnormal and stereotype schemes for basic movements and the recovery of the normal schemes imposes firstly the suppression of the pathologic ones. Patient should do the exercises without effort (efforts increase the spasticity through increasing tonic reflexes). Decrease in spasticity will be achieved by using reflex-inhibitory schemes (these restrain postural abnormal reactions and facilitate active automatic or volontary movements.

Components of the therapeutic program: We used a specific adapted rehabilitation program that contained kinetotherapy, ergotherapy, therapeutic massage, paraffin wax and electrotherapy [31, 32]. By kinethotherapy we aimed to decrease spasticity and increase motor control, to conservate range of motion and to obtain an optimal elasticity for the soft tissues, and also to prevent complications induced by a long stay in bed. By therapeutic massage we aimed to improve the peripheral vascular pathology and by paraffin wax treatment to reduce spasticity and enhance active movement. Electrotherapy (Hufschmidt/TENS/Ultrasound therapy) has been used to control pain and spasticity.

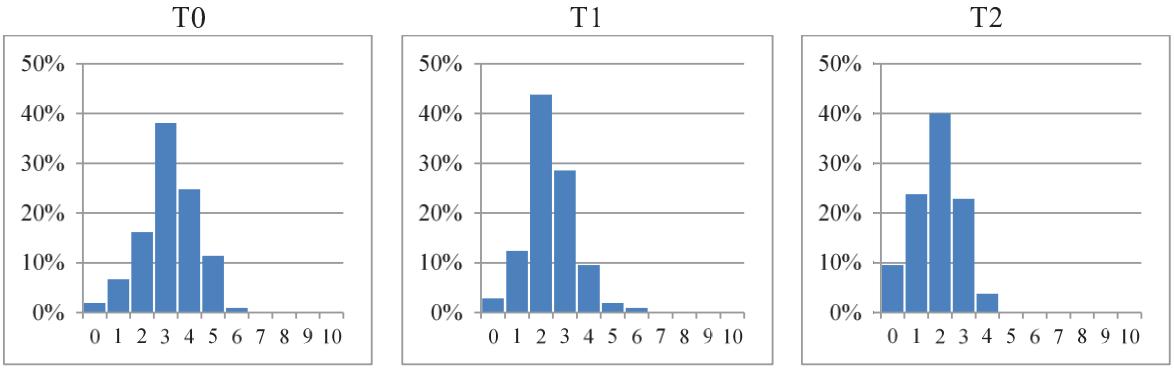
Data analysis: quantitative variables were tested for normality using the Kolmogorov-Smirnov test. Means and medians were calculated and the differences were compared between two consecutive moments (T1 versus T0 and T2 versus T1) using Wilcoxon signed-rank or Paired Samples T test.

4. RESULTS

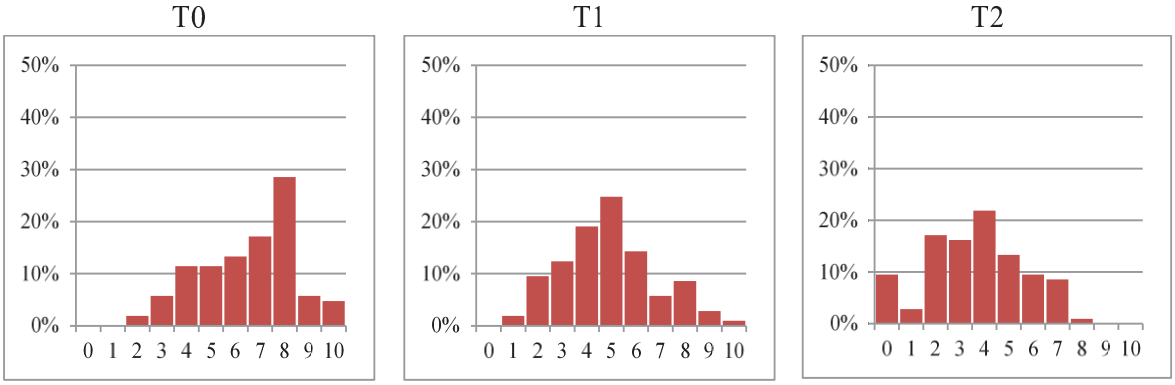
Our patients had a mean age of 60.07±13.300 years and a median of 61 years (minimum 23 – maximum 82 years), with a non-symmetric distribution by age (p=0.011, test Shapiro Wilks). 81% among them had an ischemic stroke and 66% had affectation on their left part. The median duration from the acute event has been of 5 months (minimum 2 – maximum 45 months), 57% having less than 6 months from the acute event.

Pain: In all situation the median score decreased after the kinethotherapy program and remained low at six months follow-up (shoulder - rest: from 3 to 2 and 2 at T0, T1 and T2 respectively; shoulder – mobilization: from 7 t0 5 and 4; knee – rest: from 3 to 2 and 2; knee – mobilization: from 7 to 5 and 3). Distribution of pain scores is shown in Fig. 1.

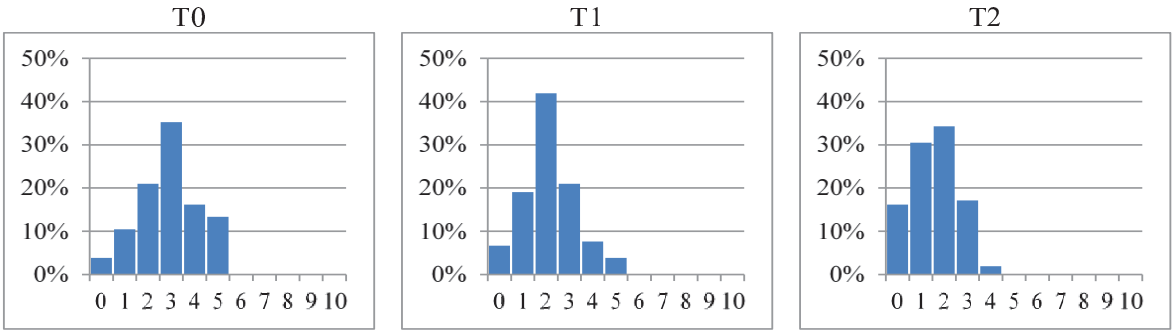
Shoulder - rest



Shoulder - mobilization



Knee - rest



Knee - mobilization

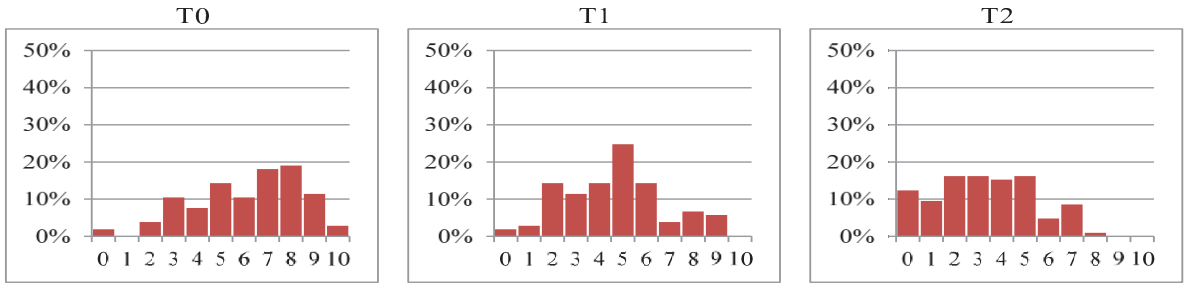


Fig. 1. Distribution of Pain scores at T0, T1 and T2

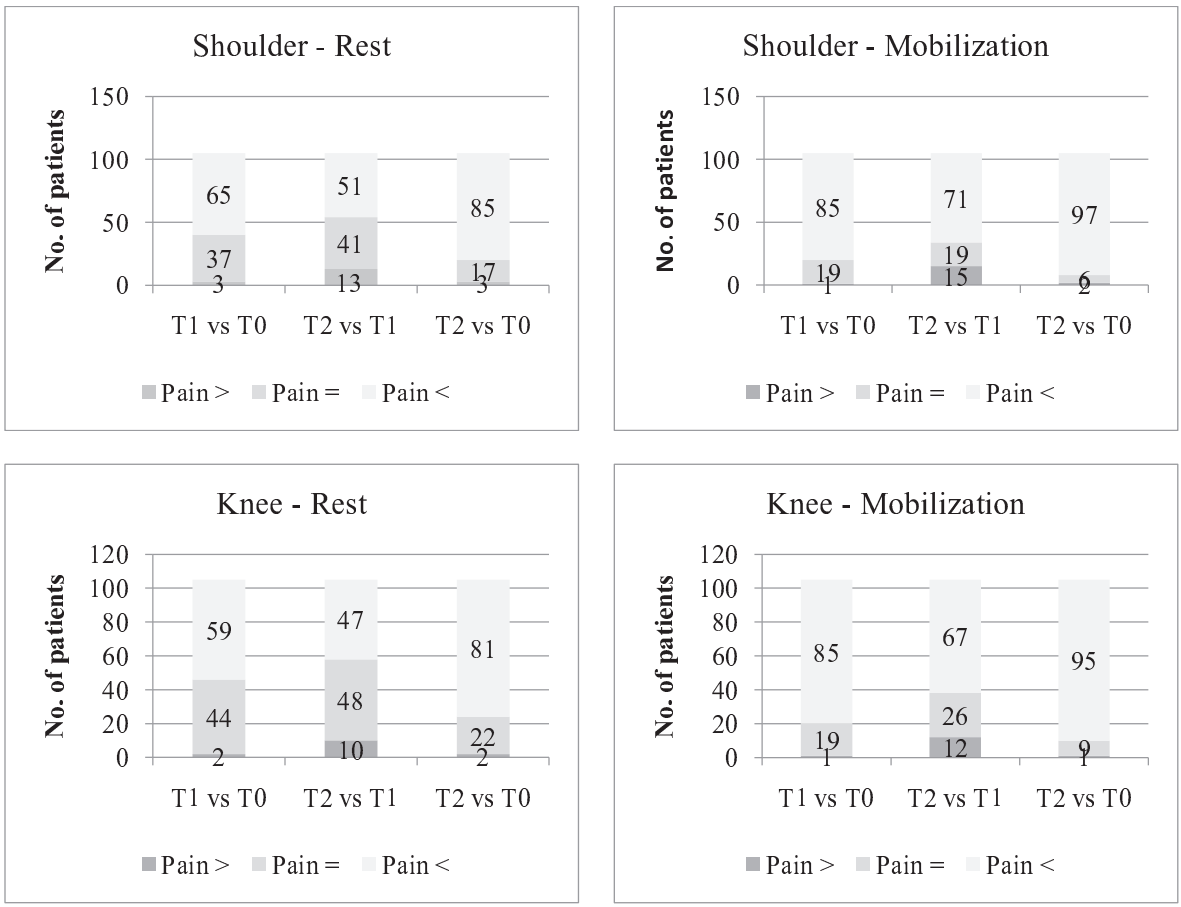
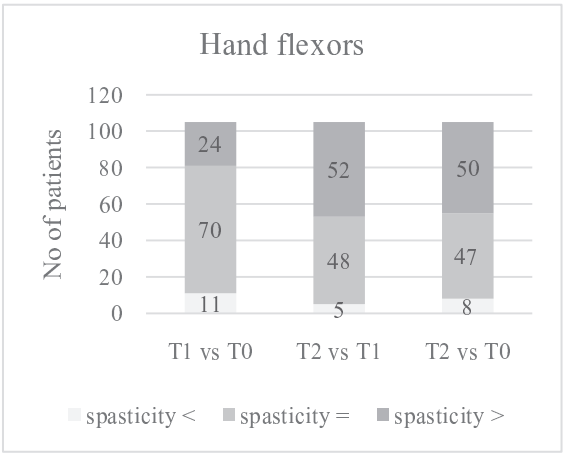


Fig 2. Distribution of patients according to the progress of their pain score

Generally, most of the patient had lower pain scores after six months, the progress being apparently slightly higher during the admission than from T1 to T2 and slightly higher for movement than in staying (no statistical significance proved).

Spasticity: Our program didn't bring significant gains in decreasing spasticity. Most of the patients tended to have an equal or increased spasticity at 6 months of both hand's flexors and thigh's adductors, this being the natural course of the disease (Fig. 3). Maintaining spasticity compared to baseline can be a target to motivate the patient.



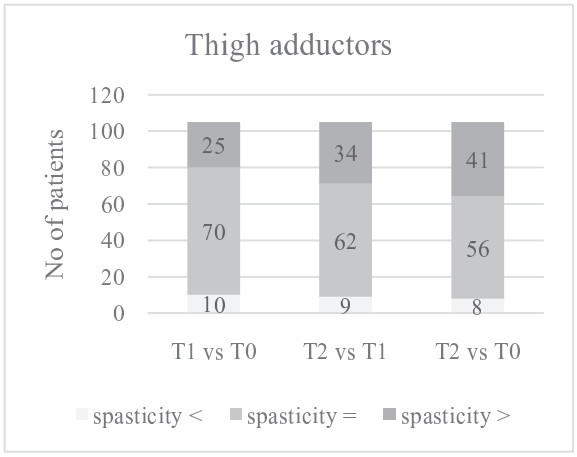


Fig 3. Distribution of patients according to the progress of their pain score

Functional independence: 94 out of 105 patients have significantly better functional scores at discharge, and the results were maintained after 6 months (median FIM score incresed from 63 to 80 and 93 respectively, $p<0.001$). The improvement became visible especially for the motor component (Fig 4).

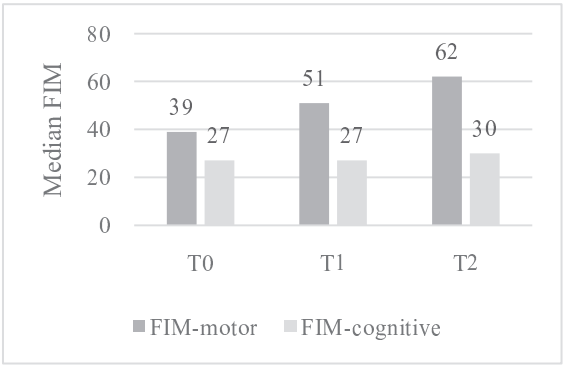


Fig. 4. Median FIM score by component

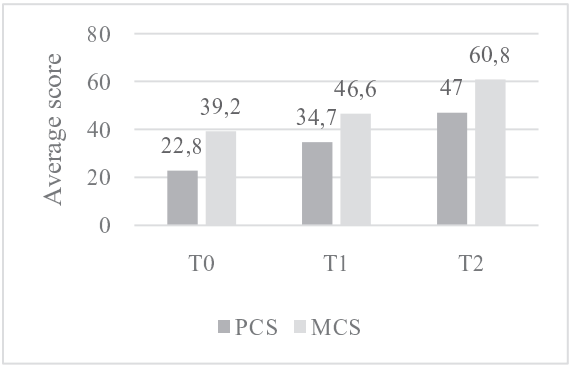


Fig. 5. Average SF-36 scores for MCS and PCS

Quality of life: Significant improvements were found in quality of life after the therapeutic program in both physical and mental components (PCS and MCS) ($p<0.05$, Paired Samples T student test). Physical component had a lower average compared to the mental one at T0 (higher functionality affectation), but the gain in average reached 106%, meanwhile 55% gain in average has been found for the mental component.

5. CONCLUSIONS

Our patients gained significant improvements in pain, functional independence and especially quality of life following the kinetotherapy program. A tendency of the group towards chronic pain was observed as regard for pain in shoulder and knee on the affected hemibody, with low intensity during rest, and medium intensity during mobilization, and with a clear

decreasing effect after kinetotherapy. Functional testing with FIM scale notes significant progress at discharge and control compared to the precedent moments, for the total value and especially motor component. Both physical and mental components of the quality of life improved significantly between every two consecutive moments. The evaluation of spasticity shows that it has not been significantly influenced by the specific rehabilitation program, thus being necessary new therapeutic, pharmacological and non- pharmacological approaches, to reduce spasticity of the wrist flexors and hip adductors. However, our results underline the importance of access to appropriate rehabilitation therapy for patients with spastic hemiparesis secondary to stroke.

REFERENCES

[1] DeLisa et coll., Physical Medicine & Rehabilitation : Principles and Practice, 4th Edition, Lippincott Williams & Wilkins, 2005 ;

[2] Sudlow CLM and Warlow CP. Comparable studies of the incidence of stroke and its pathological types. Results from an international collaboration. Stroke 28, 491-499. 1997

[3] Braddom R.L., Physical Medicine & Rehabilitation, Third Edition, Saunders;

[4] Mackay J, Mensah G: The Atlas of Heart Desease and Stroke, Geneva, Switzerland, *The Atlas of heart disease and stroke*, WHO 2004, http://www.who.int/cardiovascular_diseases/en/cvd_atlas_15_burden_stroke.pdf

[5] World Health Orngganization and US Centres for Disease Control and Prevention. The Atlas of Heart Disease and Stroke. Geneva. 2004. Available at: https://mail.google.com/mail/u/0/?tab=wm#inbox

[6] Lloyd-Jones D, Adams RJ, Brown TM, et al. AHA Heart Disease and Stroke Statistics-2010 update : a report from the American Heart Association, *Circulation* 2010 ; 121 : 46-215

[7] World Health Organization Regional Office for Europe. European Health for All Database. Available at: http://data.euro.who.int/hfadb/

[8] Cinteză M, Pană B, Cocohino E et al. Prevalence and control of cardio-vascular risk factors in Romania-cardio-zone national study – Medica – *A J of Clin Medicine*, 2007 : 277-288 ; Jenkinson, C., *Measuring Health and Medical Outcomes*; Ruta, D., Garratt, A., Chapter 9 : Health status to quality of life measurement, University of Oxford Routledge, 2013, October 18

[9] Carr, Alison J., Higginson, Irene, J., Measuring quality of life: Are quality of life measures patient centered?, „British Medical Journal", 322, 1357–1360, 2001.

[10] Smith L et al., Management of patients with stroke : Rehabilitation, prevention and management of complications, and discharge planning ; A national clinical guideline, Sccotish Intercollegiate Guidelines Network

[11] King R, Quality of Life After Stroke, *Stroke*, 1996 ; 27 : 1467-1472

[12] Buck D, Jacob A, Massey A, Ford G, *Stroke*, 2000 Aug, 31(8) : 2004-2010

[13] Segal ME, Schall RR, Determining functional/health status and its relation to disability in stroke survivors, *Stroke*, 1994 ; 25 :2391-2397

[14] Abubakar SA, Isezuo SA, Health Related Quality of Life in Stroke Survivors : Experience of a Stroke Unit, *Int J Biomed Sci*, 2012 Sep, 8(3) :183-187

[15] Gray L, Sprigg N, Bath P, et al. Sex Differences in Quality of Life in Stroke Survivors, *Stroke*, 2007 ; 38 :2960-2964

[16] Moeller D, Carpenter C, Factors affecting quality of life for people who have experienced a stroke, *International Journal of Therapy and Rehabilitation*, 2013 Apr : 20(4) :207-216
[17] Chen MD, Rimmer J, Effects of Exercise on Quality of Life in Stroke Survivors – A meta-analysis, *Stroke*, 2011 Feb
[18] Carod-Artal FJ, Trizotto DS, Coral LF, Menezes Moreira C, Determinants of quality of life in Brazilian stroke survivors, *Journal of the Neurological Sciences*, 2009 Sep, 284(1-2) :63-68
[19] Ahlsiö B, Britton M, Murray V, Theorell T, Disablement and quality of life after stroke, *Stroke*. 1984 ; 15 :886-890
[20] Saladin LK, Measuring quality of life post-stroke, *Journal of Neurologic Physical Therapy*, 2000 Oct
[21] Kauhanen ML, Korpelainen J, Hiltunen P, et al., Domains and determinants of quality of life after stroke caused by brain infarction, *Archives of Physical Medicine and Rehabilitation*, 2000 Dec, 81(12) : 1541-1546
[22] O'Mahony PG, Rodgers H, Thomson RG, Dobson R, James OF, Is the SF-36 suitable for assessing health status of older stroke patients? *Age Aging*. 1998 Jan ; 27(1) :19-22
[23] Hendrick B, Motivational Therapy Helps Treat Stroke Patients, *WebMD*. 2011, Jun 23
[24] Kagan A, Korner-Bitensky N. Virtual Reality. *Stroke Engine Intervention*. Montreal: McGill University. 2012, September 6. Available at: http://strokengine.ca/intervention/index.php?page=topic&id=28
[25] Dumoulin C, Korner-Bitensky N. Urinary Incontinence. *Stroke Engine Intervention*. Montreal: McGill University. 2012, December 16. Available at: http://strokengine.ca/intervention/index.php?page=topic&id=31
[26] Shaker R, Greenen J, Management of Dysphagia in Stroke Patients, *Gastroenterol Hepatol* (NY). 2011;7(5) : 308-332
[27] McCormack HM, Horne DJL, Sheather S. Clinical applications of visual analogue scales: a critical review. Psychol Med. 1988; 18:1007–19
[28] Bohannon R, Smith M. Interrater reliability of a modified Ashworth scale of muscle spasticity. *Physical Therapy*. 1987; 67(2): 206
[29] Ottenbacher KJ, Hsu Y, Granger KV, Fiedler R. The Reliability of the Functional Independence Measure: A Quantitative Review. *Arch Phys Med Rehabil.* 1996; 77:1226-32.
[30] 36-Item Short Form Survey from the RAND Medical Outcomes Study. Available at: http://www.rand.org/health/surveys_tools/mos/mos_core_36item.html
[31] Sbenghe T, *Kinetologie profilactică, terapeutică şi de recuperare*, 553-572, Ed. Medicală, Bucureşti, 1987
[32] Nica, SA., *Compendiu de medicină fizică şi recuperare*, 159-186, Ed. Universitară ,,Carol Davila'', Bucureşti, 1998