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Full Length Research Paper

Stroke rehabilitation: Demographic profile and rehabilitation therapy costs of outpatients with stroke in Greece

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Stroke is one of the most expensive medical illnesses. In Greece, information on rehabilitation costs after hospital discharge and type of treatment sessions have not been reported. This study provided the demographic profile, the rehabilitation training program and the direct rehabilitation costs of stroke outpatients. A retrospective study, based on a sample of 18 outpatients with stroke, who were all local residents of the prefecture of Thessaloniki and had their first documented rehabilitation session between June 2008 and May 2010. The mean age was 58.8 ± 14 years and 83.3% had ischemic stroke. The direct rehabilitation cost for all stroke cases was €99,960 for a total of 169 months (591.5 € per month for rehabilitation). Pool therapy (52.4%) was the most utilized during rehabilitation. The mean length of rehabilitation period was 9.4 ± 5.9, months. At the end of rehabilitation training program, over half of the outpatients had the need for a walking stick (61.1%). Stroke onset was higher in the evening hours (44.4%) and the spring season was noted with the most cases (38.9%). Stroke patients without any type of insurance continue to incur considerable costs for their rehabilitation therapy program after their discharge from a hospital setting.

Key words: Stroke, rehabilitation, outpatient, cost, incidence, Greece.

INTRODUCTION

Stroke is one of the most common causes of death in developed countries, leading to a remarkable acquired disability in adults. Stroke has also potentially enormous socioeconomic results of patients' lives and families' environment (Bonita, 1992; Feigin et al., 2003). In Southern Greece, in the Arcadia province, the incidence has been estimated at 319.4/100000 in both sexes for groups aged 45 to 84 years, while incidence rates of stroke among Christian and Muslim population of Xanthi province in Thrace were 173.9 and 87.2 respectively (Vemmos et al., 1999; Papadopoulos et al., 2006). These incidence rates are notably lower compared with other studies conducted in Europe and other regions of the world (Sudlow and Warlow, 1997).

A stroke survivor faces a range of longer-term problems after being out of the hospital services. Physical pain, poor balance, difficulty with speaking, reading or writing and weakness or paresis on one side of the body are some of the major problems (Adamson et al., 2004; Zorowitz et al., 2004, 2005). Therefore, majority of stroke survivors demonstrate the need for rehabilitation services in order to enhance their functional recovery and minimize acquired disabilities (Duncan et al., 2002). Stroke rehabilitation is a dynamic process and a very important part of recovery for stroke patients. This process focuses to help patients to regain their lost skills as a result of the stroke, in order to return back to their independent daily lives (Burton, 2000; Roth, 2009).

Many traditional therapeutic exercise interventions have been used in rehabilitation to promote functional recovery for stroke patients including pool, physical and speech therapy (Lincoln et al., 1984; Cifu and Stewart, 1999; Jette et al., 2005; Noh et al., 2008). It is estimated that the direct costs, including the costs for hospital and outpatients care and social services of stroke patients were $1306 million in Sweden (Terént et al., 1994). In

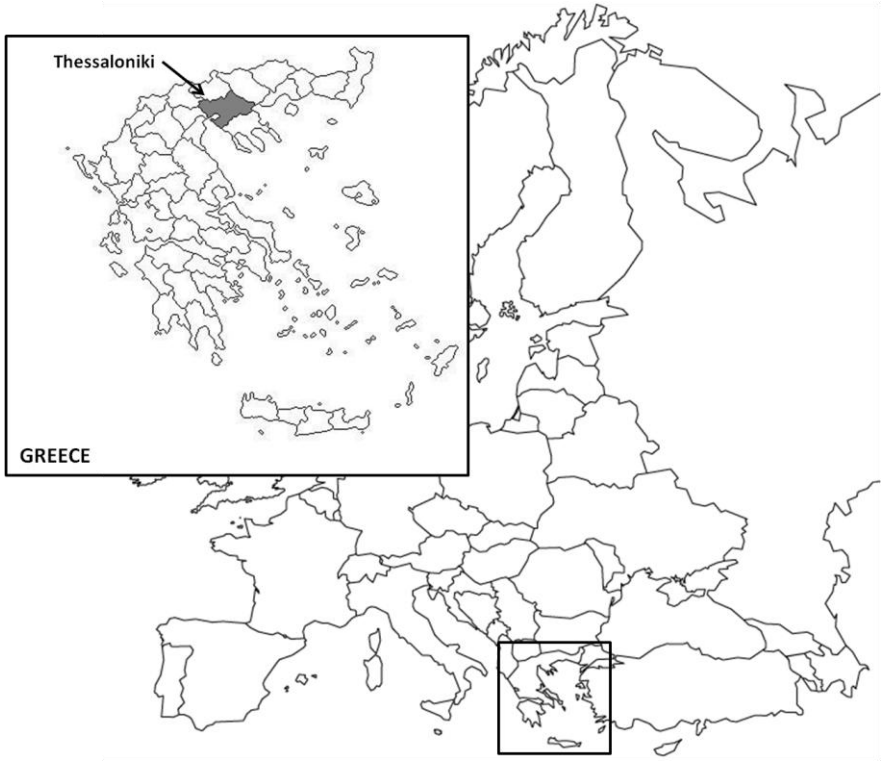

Figure 1. Geographical map depicting the municipality of Thessaloniki, Greece.

1993, the average cost of stroke per patients was $12,120 depending on the length of hospital stay and the initial stroke severity (Jørgensen et al., 1997). In Greece, the estimated direct in-hospital cost of acute ischemic and hemorrhagic stroke patients was €1,551,445 and the mean in hospital cost per stroke patients was €3,624.9 and hemorrhagic strokes seem to be more expensive (Gioldasis et al., 2008).

Rehabilitation therapy seems to be continued for many stroke patients after hospital discharge (Corr and Bayer, 1995). No stroke registries have been published in Greece about rehabilitation costs and types of therapies for outpatients with stroke. Due to this lack of information, the main objective was to describe the total rehabilitation cost for outpatients with stroke. Distribution of overall rehabilitation therapies, as well as the number of therapy sessions and the description of demographic profile of outpatients were also investigated.

MATERIALS AND METHODS

Study subjects

This retrospective study included 18 outpatients with stroke, who were local residents of the prefecture of Thessaloniki located in central Macedonia (Figure 1), and admitted in a private rehabilitation center between June 1, 2008, and May 30, 2010. All the stroke patients have their medical problems under control enough to live in their own homes and can travel to get their therapies.

The focus of the rehabilitation therapy program (RTP) was to optimize functional independence and at the same time to attain the best possible quality of life. The RTP consisted of physical therapy, pool therapy and speech therapy sessions and the length of each therapy session lasted about one hour. The frequency of sessions varied depending on the program of each patient's needs. Physical therapy and pool therapy are aimed to increase the strength of the affected limbs, improve balance, reduce activity limitations and restore functional movement. Physical therapy sessions generally consisted of proprioceptive neuromuscular facilitation (PNF), neurodevelopmental treatment (NDT), as well as, motor relearning program. Pool therapy sessions performed in a warm water therapeutic pool (water temperature range 28 to 30°C and the pool depth range from 0.70 to 1.30 cm) and consisted of exercises which focused on balance, stretching, strengthening and improvement of aerobic capacity. Speech therapy focused to increase communication and motor production of speech, as well as, chewing and swallowing. The speech therapy methods were stimulation with auditory and visual sense, as well as, stimulation word-oriented therapy. Each therapy session carried out by one therapist and one patient. Rehabilitation therapy was

given weekly according to all patients needs by physiotherapists, speech therapists and gymnasts within the stroke unit. The need for rehabilitation program was evaluated initially in all patients by the physician. The needs of the patient, the specific goals set for the patient and the rehabilitation achievements were discussed twice a month by the multidisciplinary rehabilitation team in order to reorganize the RTP. Patients finished their rehabilitation program when further improvements were considered unlikely by the rehabilitation team.

Stroke patients were included in the study if they met the following criteria: (i) diagnosis of a stroke according to the World Health Organization definition of stroke (WHO Monica Project, 1998-1999); (ii) none of the patients were experienced with any form of therapy in any specialized rehabilitation center, before initiation of this rehabilitation therapy program; (iii) their age during the start of rehabilitation program was 18 years or older; (iv) the ability to follow simple verbal commands and instructions.

Rehabilitation cost

Cost for rehabilitation was computed as the cost of total number of therapy sessions which were recorded for each outpatient based on database of rehabilitation center. All outpatient cost data associated only with the total number of physical therapy, pool therapy and speech therapy, without included any cost of medication. Cost of assistive devices such as sticks, medical walker and splints were not included in the overall cost. The Greek healthcare system allows the uses of a private rehabilitation center, the primary purpose of them are to provide health and hospitalization services in inpatients and outpatients suffering from musculoskeletal, nervous, circulatory and respiratory system diseases. Patients with private or public insurance were fully reimbursed for the cost of all rehabilitation therapy sessions (maximum 80 sessions per year) from the National Health Insurances, while patients without insurance were responsible to pay the full cost of therapy sessions. Costs were calculated using the official financial charts in euro (€).

Statistical analyses

SPSS statistics v19 (SPSS Inc, Chicago, IL) was used for data management and analyses. Demographic and clinical features were analyzed descriptively in terms of percentages. Cross tabulation was used between gender; male and female, and rehabilitation devices; walking stick, splint and medical walker. For data analysis, outpatients were grouped by gender, age group (≤60 years or >60 years) and stroke type (ischemic or hemorrhagic). Non-parametric test of Mann-Whitney U-test was used to determine if a difference exists between groups. The independent samples *t*-test was used to compare mean measured values between the two groups. Results were expressed as mean ±SD and significant level for all statistical tests was set at $p < 0.05$.

RESULTS

Among the 18 outpatients with stroke 15 had ischemic stroke and 3 hemorrhagic stroke, with a mean age of 58.8 ± 14 and half of them (50%) were men. The youngest patient with stroke for comprehensive rehabilitation was 37 years, while the oldest patient was 83 years, with approximately 33% of the patients less than 50 years. Demographic and clinical features of the study population are presented in Table 1.

Duration of rehabilitation and costs of stroke rehabilitation

The mean duration of rehabilitation period was 9.4 ± 5.9 months for 18 outpatients. Overall, the mean duration of rehabilitation was greater for females (10 ± 5.7), age group ≤60 years (11.4 ± 7.3) and hemorrhagic outpatients (15 ± 7.9) (Figure 2). The direct cost for all stroke outpatients was €99,960 for a total rehabilitation period of 169 months (€591.5 per month). The mean cost per stroke outpatient was 5,553.3 ± 3,420.9€. Three patient did not have a private or public insurance and the mean cost per them was 1,446.6 ± 315€. The mean total rehabilitation cost was greater for male 6,074.4 ± 4,171.1€, age group ≤60 years 6,766.7 ± 4,283.7€ and hemorrhagic outpatients 9,100 ± 6,376.9€ (Figure 3). As shown in Table 2, among outpatients who received rehabilitation therapy, the mean number of treatment sessions was 79.3, with the pool therapy presenting with a mean number of 49.7 sessions, followed by physical therapy (36 sessions) and speech therapy (19.9 sessions). Figure 4 shows the mean number of treatment sessions according to the type of therapy and gender. No significant differences were noted in physical and pool therapy between male and female outpatients ($p = 0.765$, $p = 0.843$ respectively), whereas speech therapy was found to be greater in male outpatients ($p = 0.032$).

Effects of rehabilitation therapy program

Table 3 shows patients' needs for rehabilitation devices at the end of RTP among stroke outpatients. At the end of RTP, the number of outpatients who had no need of a rehabilitation device was 5 (27.8%). Over half of the outpatients had the need for a walking stick at the end of RTP (n = 11, 61.1%) and six stroke outpatients (33.4%) had the need for a splint at the end of RTP (6 outpatients used an arm splint and 3 of these 6 outpatients used an arm and foot splint). One patient had the need for a

Table 1. Demographic and Clinical features of stroke outpatients.

Variable	n	%
Age group (years)		
≤60	9	50
>60	9	50
Gender		
Male	9	50
Female	9	50
Marital status		
Single	2	11.1
Married	14	77.8
Widow	2	11.1
Employment status		
Employed	6	33.3
Retired	9	50
Unemployed	3	16.7
Health insurance status		
Private/Public insurance	15	83.3
No insurance	3	16.7
Stroke Type		
Ischemic	15	83.3
Hemorrhagic	3	16.7
Side of involvement		
Dominant side	7	38.9
Non-dominant side	11	61.1
Side of hemi-paresis		
Right	7	38.9
Left	11	61.1
Season of stroke incidence		
Spring	7	38.9
Summer	3	16.7
Autumn	2	11.1
Winter	6	33.3
Stroke onset in day periods		
Morning	6	33.3
Afternoon	4	22.3
Evening	8	44.4
Night	0	0

medical walker.

Time of stroke

With respect to the timing of onset stroke, it was noted that January and April present the highest incidences for stroke, while the spring season was noted to have the most cases (7 outpatients, 38.9%), followed by winter season (6 outpatients, 33.3%). Stroke onset rate was higher in the evening (5 to 9 pm; 8 outpatients, 44.4%) and morning (6 am to noon; 6 cases, 33.3%) hours and lower in the afternoon and at night (Table 1).

DISCUSSION

The estimation of stroke costs on the national level is mostly focused on the in-hospital direct cost of acute stroke and has not included any outpatient rehabilitation costs. The current study captured costs of rehabilitation therapy program for stroke outpatients. This is to our knowledge the first health economic presentation for the total rehabilitation cost of outpatients with stroke in Greece. This study found differences in outpatient costs for patients with different stroke types, age groups and gender. A study conducted in Texas reported that the average yearly cost of service utilization was $11,689 including physical therapy (45.2%), occupational therapy (36.9%) and speech therapy (17.9%) (Godwin et al., 2011). In the present study, the mean cost per stroke outpatient was €5,553.3, including physical therapy (34%), pool therapy (47%) and speech therapy (19%), for a mean duration of rehabilitation of 9.4 months. The study also mentioned three patients who did not have any kind of insurance and as result they had to pay all the amount of rehabilitation costs.

Gioldasis and colleagues (2008) found that patients with hemorrhagic stroke were the most costly with a total in-hospital direct cost of €5,300 on average and that the cost for hemorrhagic stroke was 70% higher compared with the average cost for ischemic stroke. They also found that the length of stay was significantly higher in patients with hemorrhagic than those with ischemic stroke. Similar studies from Argentina and Turkey have demonstrated that the direct hospital cost for hemorrhagic stroke patients was noted to be greater than those with ischemic stroke (Christensen et al., 2009; Asil et al., 2011). Other study has examined the differences in rehabilitation costs between hemorrhagic and ischemic stroke patients and reported greater cost for inpatient and outpatient rehabilitation costs for those with intracerebral hemorrhage (Cadilhac et al., 2009). In this study, a relative finding was that the total outpatient rehabilitation cost for patients with hemorrhagic stroke was 88% higher compared with the total rehabilitation cost for outpatients with ischemic stroke. Hemorrhagic stroke patients tend to be in a more severe condition and had the need for a larger number of therapy sessions and also a longer duration of rehabilitation therapy period.

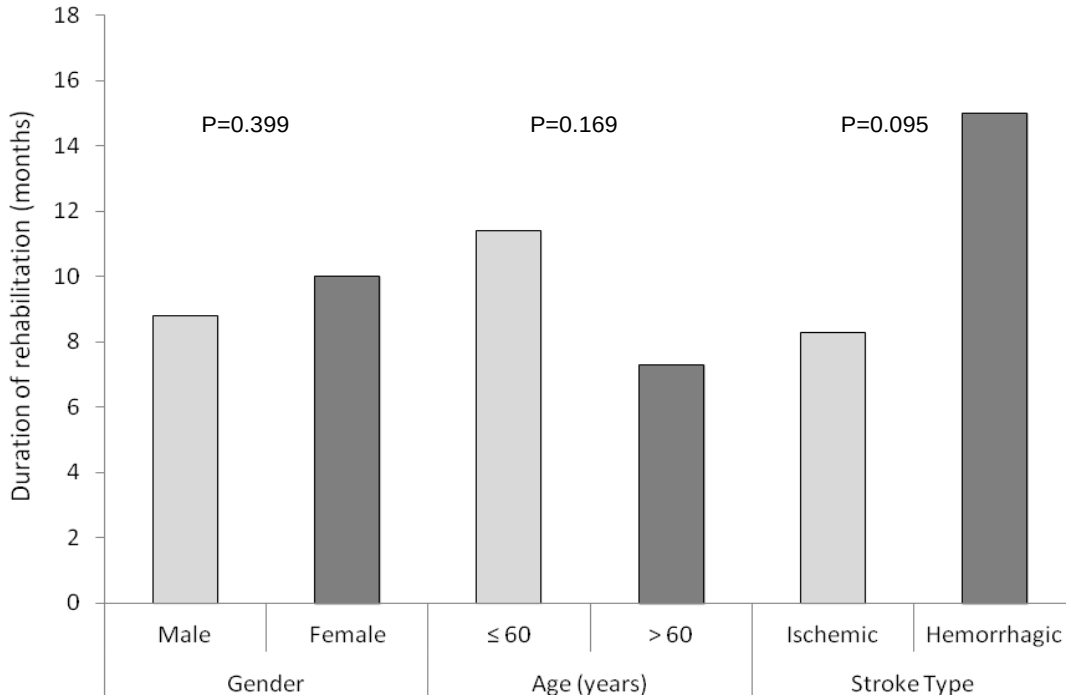

Figure 2. The distribution of duration of rehabilitation period among gender, age group and stroke type.

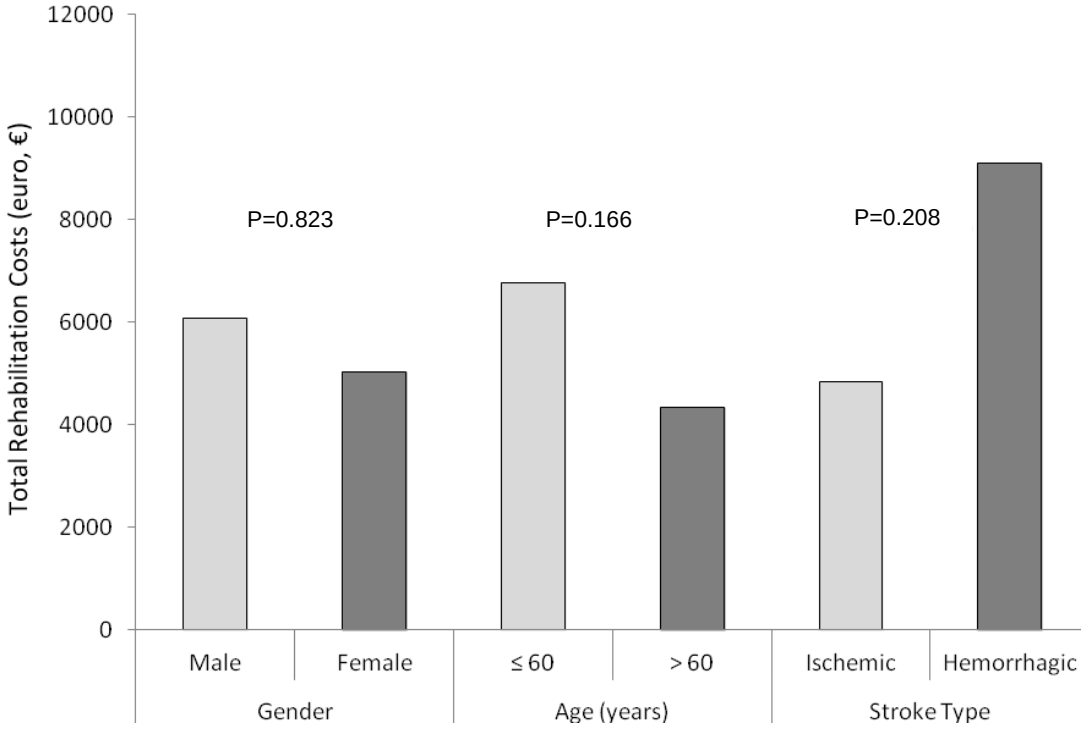

Figure 3. The distribution of total rehabilitation costs among gender, age groups and stroke types.

After leaving hospital, stroke survivors should be treated in a comprehensive rehabilitation stroke unit (Miller et al., 2010). Duration of rehabilitation for the patients may vary according to their stroke severity and functional disability.

Table 2. Number of therapy sessions and costs of rehabilitation among 18 stroke outpatients.

Variable	Treatment sessions (number)	Total rehabilitation costs, EU €
Total Rehabilitation		
Mean (SD)	79.3 (48.9)	5553.3 (3420.9)
Median	80	5600
Range	217	15190
Minimum-maximum	16-233	1120-16310
Physical Therapy (n = 14)		
Mean (SD)	36 (25.8)	2520 (1807.1)
Median	36.5	2555
Range	77	5390
Minimum-maximum	3-80	210-5600
Pool Therapy (n = 15)		
Mean (SD)	49.7 (41.7)	3476.7 (2921.3)
Median	34	2380
Range	119	8330
Minimum-maximum	7-126	490-8820
Speech Therapy (n = 9)		
Mean (SD)	19.9 (14.7)	1392.2 (1030.2)
Median	15	1050
Range	40	2800
Minimum-maximum	4-44	280-3080

Total rehabilitation includes physical therapy, pool therapy and speech therapy.

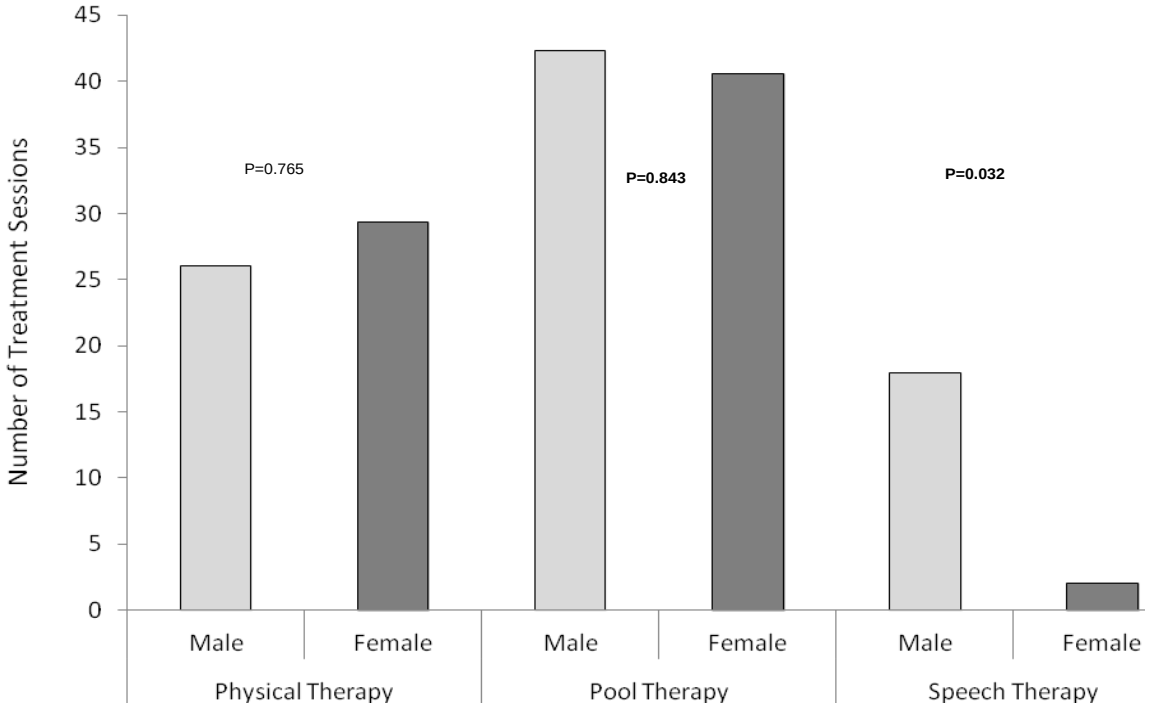

Figure 4. The mean number of treatment sessions of rehabilitation therapy program in male and female stroke outpatients.

Table 3. Use of rehabilitation devices at the end of RTP between the genders.

Gender	Rehabilitation devices									
	Walking stick		Splint		Medical walker		Walking stick and Splint		No devices	
	n	%	n	%	n	%	n	%	n	%
Male	4	22.2	1	5.6			3	16.7	1	5.6
Female	2	11.1			1	5.6	2	11.1	4	22.2
Total	6	33.3	1	5.6	1	5.6	5	27.8	5	27.8

Miller et al. (2010) indicated that outpatient rehabilitation duration varies based on individual resources and functional needs, and this period is greater than 4 to 6 months. Thus, as was expected, this statement seems to be confirmed by findings in this study, where only three patients underwent a two months rehabilitation program. Duration and total cost of rehabilitation among patients with stroke was not significantly different between gender, age groups and stroke types. Although the duration of rehabilitation period was greater for female than male outpatients, the total rehabilitation cost was higher for male outpatients. This may be due to the fact that male outpatients underwent more frequent therapy sessions per months.

Pool therapy is an effective treatment for impairments, functional limitations and disabilities, which composed of water walking or running, water balance training, stretching and strengthening exercise (Lee et al., 2006; Noh et al., 2008). In patients with stroke, pool therapy has been shown to improve balance, gait speed and strength of the affected limb (Noh et al., 2008). Recent studies demonstrated that aquatic therapy is beneficial therapeutic modalities for musculoskeletal relaxation and neuromotor control, as well as water-based exercise exhibited notably benefits in cardiovascular fitness and static balance in stroke patients (Chu et al., 2004; Lee et al., 2006; Park and Roh, 2011). The results of this study indicate that rehabilitation therapy program was focused in physical, pool and speech therapies for stroke outpatients. The majority of treatment sessions for both genders were in pool therapy, while physical therapy was second followed by speech therapy.

In this study, over half of the stroke outpatients had the need for a walking stick at the end of RTP in order to improve their mobility and be independent in activities of daily living. It has been shown that the use of mobility assistive devices such as canes is often prescribed for stroke survivors, and it can improve mobility and allow for independence in the performance of mobility-related tasks (Boissy et al., 2007). Only one outpatient did not reach the maximum walking ability at the end of RTP and this may due to the short rehabilitation period which was for 2 months as well as the small number of rehabilitation sessions (total rehabilitations sessions, 25). Maybe the lack of a private or public insurance was also a possible explanation. Another alternative explanation may be the severe condition after stroke episode, which leads to a remarkable weakness. However, a noteworthy number of stroke outpatients completed the RTP without the need of a rehabilitation device; this may due to the fact that these patients had suffered from mild stroke.

This study presents the same mean age between male and female outpatients with stroke with a total mean age of 58.8 years. This finding is quite similar with a study conducted in the Physical Medicine and Rehabilitation Department at Ankara in Turkey (Yavuzer et al., 2001), but seems not to agree with the most studies of the literature, where the mean age of stroke patient is greater (Grieve et al., 2001; Gioldasis et al., 2008). This may be due to the fact that this study included only outpatients with stroke. Regarding the type of stroke, ischemic strokes represent about 80% while 20% had hemorrhagic stroke. These results are similar to the results in other studies that show a great majority with ischemic strokes (Yavuzer et al., 2001; Papadopoulos et al., 2006; Gioldasis et al., 2008; Lee et al., 2010).

The results of this study revealed that spring and winter seasons present the most stroke incidence. In these seasons, Thessaloniki records the lowest temperature and January is the coldest month of the year in the city. Matsumoto et al. (2010) showed that variations in the climate temperature were a variable with the potential to cause thromboembolic disease, including stroke. Low temperature is known to contribute to an increase in stroke incidences and more specifically northern countries in Europe present a higher stroke incidence than those in the south as a result of more cold months in a year (Shinkawa et al., 1990; The Eurowinter Group, 1997; Bejot et al., 2007). Several studies in literature have observed a circadian variation on cardiovascular events, with the highest incidence occurring during morning hours (Wroe et al., 1992; Muller, 1999). In a recent study in Greece, the major finding was that there were two peak diurnal variations in stroke incidence with higher rate in the mornings and evening hours and lower rate in the afternoon and at night (Stergiou et al., 2002). These results are in accordance with the findings in our stroke sample.

The present study had some limitations. Firstly, the limited sample size severely limits the power and therefore the significance of statistical analysis. Also, the small sample size limits the modeling of the total

rehabilitation costs. Second, the ability to generalize the findings of this study may be limited because of its location in a single rehabilitation center. Third, the lack of information regarding the medications consumed by patients with stroke may also underestimate the total rehabilitation costs. Despite these limitations, this study offers comprehensive information to date about rehabilitation costs. Future studies should be focused on considering more financial data on the needs of stroke outpatients after their hospital discharge, including medication, as well as to include a larger sample of patients.

Conclusions

This study demonstrated the costs of rehabilitation therapy program in outpatient with stroke. Stroke survivors without private or public insurance continue to contribute a substantial amount of money for their rehabilitation therapy program after their discharge from a hospital setting. Also, this study identified important demographic variables which do not correlate with stroke rehabilitation functional outcomes. Stroke is a catastrophic disease and a major cause of long term disability in most developed countries, thus stroke rehabilitation is focused to improve patients' functional independence and reduce the use of any rehabilitation device. In order to achieve this goal, it is of great importance to have an ideal rehabilitation team which consists of doctor, nurse, physiotherapist, speech therapist and gymnast. Therefore it is obvious that a successful rehabilitation therapy program for stroke outpatients depends on a well supervised patient-centered approach.

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