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HAND SURGERY – POSTOPERATIVE RECOVERY AND MEDICAL TOURISM

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Abstract

Medical tourism is a growing industry worldwide. Romania has spa treatment facilities that can ensure the development of medical tourism. This article presents a statistical analysis of hand surgery in Romania in 2012. Using adequate quantitative methods we highlight significant differences between age groups and differences regarding procedures that have gender particularities.

Recovery after such surgery can be achieved through spa treatment Romania, taking advantage of lower prices compared to other developed countries and numerous medical tourism facilities.

Keywords: Medical tourism, spa tourism, hand surgery, gender differences, ANOVA

JEL Classification: L83, C10, C52, I11

Introduction

Traumatology and hand surgery are very common pathologies because the hand is the main link between the human body and the environment. In this article we present a statistical analysis of hand surgery in Romania in 2012. Rehabilitation after surgery is very important and is a complex process that consists of electrotherapy, physiotherapy and other spa procedures. Romania has a number of spa treatment facilities for recovery after surgery. Techirghiol mud massages and wraps is used for trauma recovery, treatment of tendons and ligaments. Mangalia also uses peloid mud from the Techirghiol Lake to treat post-traumatic and postoperative after surgery.

Spa treatment facilities in Romania are the main factor for the development of medical tourism. Thus, in 2012 the number of beds in sanatoria resorts increased to 1939 from only 910 in 2002. Another factor that determines the development of medical tourism is the lower prices of treatments performed in resorts in Romania compared to those in other developed countries. The development and spread of Internet communication technologies contribute significantly to the development of medical tourism (Bookman, 2007). Medical

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tourism also contributes to regional development (Andrei, 2007). With the entry into force of the European Directive on patients' rights in cross-border treatment that facilitates their access to cross-border healthcare and reimbursement of the expenses, medical tourism industry in Romania can record important progresses.

There is a high potential for development of spa and medical tourism in Romania. In table 1 we present Romanian and foreign tourist arrivals in the first nine months of 2013. The data presented here highlight the following:

- A low share of only 5.3% of foreign tourists in the total number of tourists;
- An important part of Romanian tourists choose the 2 and 3 star hotels;
- A small number of Romanian and foreign tourists choose for five-star hotels.

Table no. 1: Arrivals of tourists in tourist accommodation facilities during the period 1.I - 30.IX.2013

	Romanian tourist arrivals	Foreign tourist arrivals	Total	The share of Romanian tourists in the category of classification	The share of foreign tourists in the category of classification	The share of the category in total Romanian tourists	The share of the category in total foreign tourists
1	2	3	4	5	6	7	8
Unclassified	6491	38	6529	99.4	0.6	1.30	0.14
1 star	11519	184	11703	98.4	1.6	2.30	0.66
2 stars	235863	10326	246189	95.8	4.2	47.19	37.15
3 stars	170327	7261	177588	95.9	4.1	34.08	26.13
4 stars	75391	9948	85339	88.3	11.7	15.08	35.79
5 stars	208	36	244	85.2	14.8	0.04	0.13
Total	499799	27793	527592	94.7	5.3	100.0	100.0

Data source: NIS data in columns 2-4, Accommodation structures attendance of tourist in the period 1.I - 30.IX.2013 November 2013, columns 5-8 authors' calculations.

1. Literature review

Recovery after hand surgery in Romania is facilitated by the existence of a number of specialized resorts. They contribute to the development of medical tourism which is a field that records an average annual growth rate of approximately 20% worldwide (Deloitte, 2008). Medical tourism in Romania benefits of much lower costs than in developed countries like USA, UK, Germany (Lunt, 2012), (Andrei, 2010).

Medical tourism and the factors underlying its development are analysed in many studies. Thus, Gan (2011) studied the differentiation of medical tourism market in the USA using techniques such as principal component analysis and cluster analysis. Enderwick (2011) presents an analysis of how emerging economies deal with medical tourism with a particular focus on four Asian countries: Thailand, India, Malaysia and Singapore. The author presents a theoretical analysis of competitiveness and further development of medical tourism sector in the four Asian countries.

Omay (2013) presents a number of opportunities and threats by analysing the medical tourism in Turkey. Taiwan's medical tourism experience is presented by Liu (2012) that emphasizes the support which the government attaches to this area by investing in health care and promotion of the health services offered. Parsiyar (2009) presents the medical tourism in the USA noting that many American citizens turn to health services in Latin America that offer very competitive rates and analyse the consequences of government action or inaction related to this field. The author emphasize that medical tourism is growing in the Americas due to particularly low prices charged for medical services by countries in Latin America.

Mainil (2011) analyses the impact of medical tourism through mass media pointing out that there are still serious limitations in knowing how patients make the decision to treat in another country, experiences in these situations and what happens to a patient when reach a total cultural environment different from his native country.

Chee (2010) emphasizes the involvement of the state in promoting private sector of medical services to patients from other countries in two Asian countries: Singapore and Malaysia. These are two of the main countries that provide medical tourism services worldwide. The article highlights medical reforms undertaken by the two countries to reduce differences in quality of care provided by the public and private sectors.

2. Methodology

Several international studies (Alderman, et al., 2006, Tamaoki, et al., 2010) show significant differences between men and women on the occurrence of hand surgery. There are also highlighted specific interventions and motivations of interventions that strengthen the differences between men and women on these procedures.

Based on these studies and using exhaustive databases (National Statistics Institute – SAN Survey, 2012) we test the following hypotheses:

- H01 surgery in the hand differs significantly in terms of their occurrence in women compared with men in various age groups;
- H02 emergence of types of surgery in the hand is gender specific. Some interventions occur more frequently in women than in men;

To test these hypotheses we used ANOVA method.

To test the hypothesis H01 we considered the following procedure:

We define the following assumptions:

$$H_0 \quad \mu_1 = \mu_2 = \dots \mu_k$$

$$H_1 \quad \text{non } H_0$$

Where μ_i is the average number of hand surgery corresponding to an age group.

For hypothesis testing we determine:

$$\text{Total variation TS} = \sum_{j=1}^s \sum_{i=1}^k (y_{ij} - \bar{y})^2 \text{ which is decomposed in two parts:}$$

$$WG = \sum_{j=1}^s \sum_{i=1}^k (y_{ij} - \bar{y}_i)^2$$

random factors,

$$BG = \sum_{j=1}^s \sum_{i=1}^k (\bar{y}_i - \bar{y})^2$$

which is the variation between the groups and the variation explained by the treatment / factor, in this case the factor or treatment being represented by the patient's age group.

$y_{ij}, \bar{y}, \bar{y}_i$ represent in this order, the individual value in age group i , the overall average of the sample and that the average for the age group i .

We computed the Fisher statistics based on the following relationship:

$$F = (BG / k - 1) / (WG / n - k) = (BG / WG)(n - k) / (k - 1)$$

where k is the number of classes (age groups) and n is the sample volume.

Finally, we compared F computed based on sample data with the one given by Fished-Snedecor distribution and for a significance level α we took the decision as follows: if F is not less than the critical value then reject the null hypothesis otherwise null is accepted and it is concluded that with the probability $P=1-\alpha$ the factor/treatment did not cause significant changes in the outcome.

Testing the hypothesis $H02$ is similar but in this case the factor is not given by age group, but by the type of surgical procedure.

3. Results and discussions

In Romania in 2012 there were 20086 cases of hand surgery for males and females. These were distributed differently for males (there were 16,582 cases that represents 82.6% of total cases) and women (3,504 cases that represents 17.4% of total cases). The graph in figure 1 shows the distribution of the number of surgery for men and women.

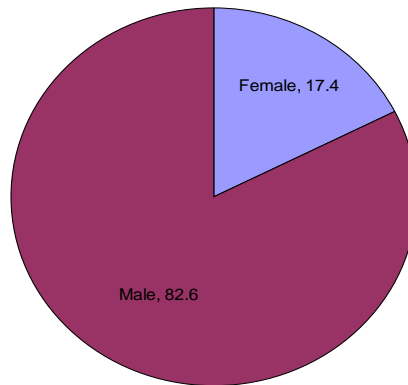


Figure no. 1: Distribution of hand surgery interventions for men and women in 2012

The graph in figure 2 shows the number of surgeries for males and females by age groups. Data presented in this chart highlight the significant differences between the two groups of people both on total and in seven age groups considered.

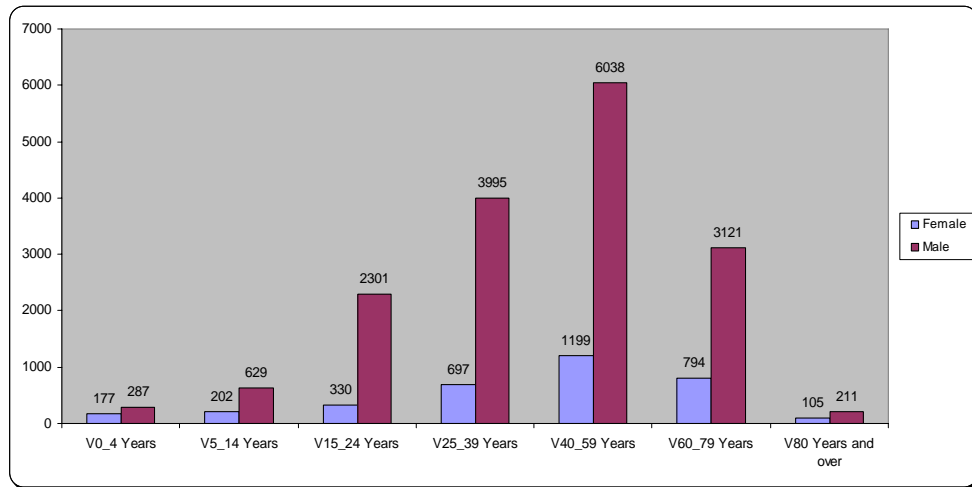


Figure no. 2: Distribution of the number of hand surgery interventions for men and women by age group in 2012 in Romania

To determine whether there are significant differences between men and women in relation to the number of hand surgery interventions we calculated for each age the ratio of the number of cases for men and women and we applied ANOVA. The reported values for each age group are shown in figure 3, and the results of the ANOVA are summarized in table 2.

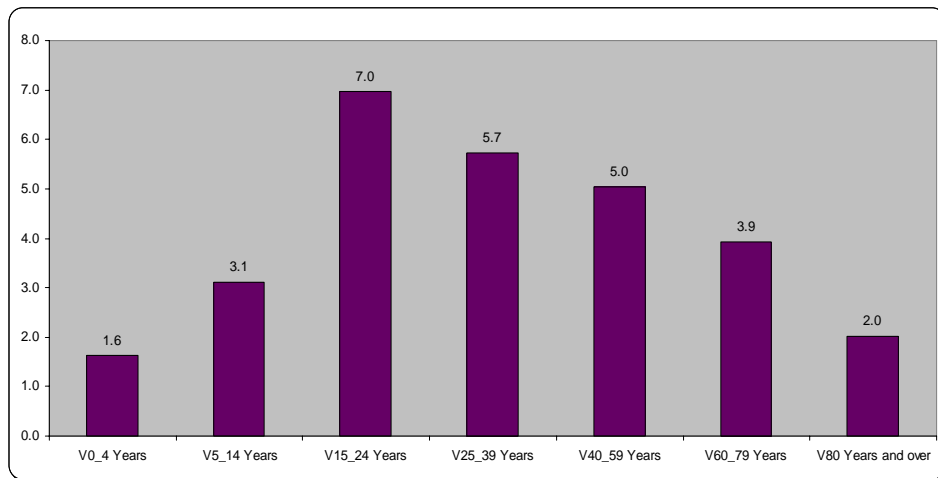


Figure no. 3: The ratio of male and female hand surgery interventions

Table no. 2: ANOVA to establish differences between men and women in the age distribution of the number of hand surgery

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	12216720	1	12216720	4.94	0.046	4.75
Within Groups	29686755	12	2473896			
Total	41903475	13				

*Authors computations using Microsoft EXCEL.

There are important differences between the number of hand surgery in women and men. The value of F statistics from ANOVA equals to 4.94 and confirms this difference between the number of hand surgery for women and men. In 2012 the ratio of hand surgery interventions for men and women was 4.7 males to a female person. This ratio is different for different age groups. The biggest differences between the two groups of people are in the three age groups between 15-60 years. By the age of 24 years the value of the ratio of hand surgery for men and women increased from 1.6 in the age group under four years, to 7.0 in the age group 15-24 years. From the age of 25 years the value of this ratio decreases continuously reaching the level of 2.0 for persons older than 80 years.

The age distribution of the number of hand surgery for men and women shown is in figure 4. In order to determine if the two data sets are significantly different we applied ANOVA and the results are shown in table 3. The results showed no significant differences between the two data sets.

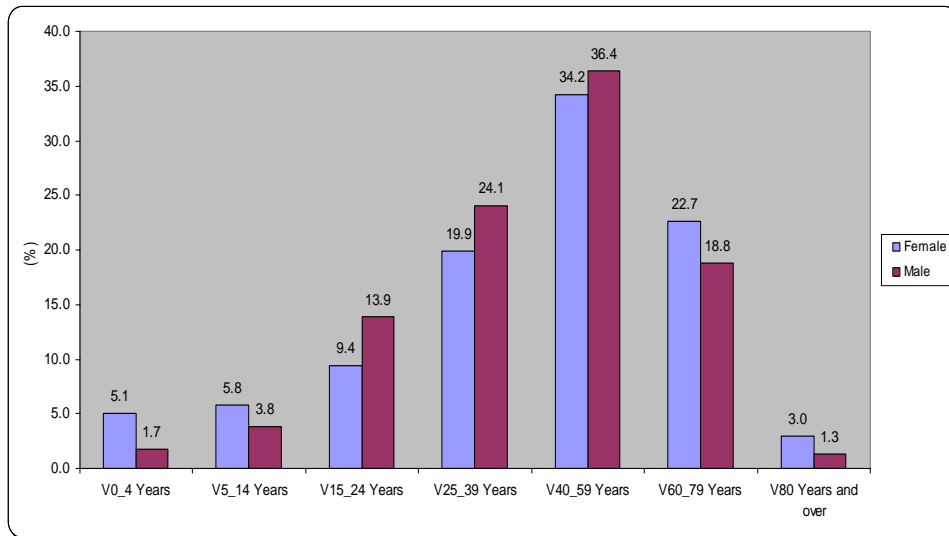


Figure no. 4: The age groups structure of the number of hand surgery for males and females in 2012 in Romania

Table no. 3: ANOVA for computing the differences between men and women in the age groups distribution of the number of hand surgery

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	20004395	6	3334066	1.07	0.46	3.86
Within Groups	21899080	7	3128440			
Total	41903475	13				

*Authors computations using Microsoft EXCEL.

Although there is no significant gender differences on the frequency of appearances of hand surgery by age groups it can be seen a parabolic trend with age. Thus, interventions appear more frequently in the working age being able to associate their appearance with the type of occupation and type of work (Sinescu, R. et. all, 2014).

In the following we analyse the frequency of surgery for men and women by the type of intervention. In 2012 at national level there have been 20086 hand surgeries in Romanian hospitals. Table 4 shows the distribution of hand surgery by the total number, male and female. The graph in figure 5 shows for the entire population, males and females the cumulative frequencies calculated by the types of interventions that have been previously sorted in ascending order by relative frequencies.

The results reveal the following:

- For the entire population who underwent hand surgery three types of interventions cumulates 52.2% (they have codes 1466, 1457 and 1440) of the total number of interventions.
- The concentration on specific types of surgical intervention is more pronounced in females compared to the male. Thus for the females the most common five interventions covering 65.5% of the total number of interventions in this group of people, while for males this value is equal to 42.5%.
- The most common intervention for men is "Closed reduction of dislocation of the hand articulation" representing 13.3%.
- The most common intervention for women is "Repair of the tendon of hand" which represents 23.3% of total.

Table no. 4: Distribution of hand surgery by the type (%)

CODE	Name	Total	Male	Female
1445	Synovectomy of the wrist	0.18	0.01	0.49
1473	Procedures for baseball finger	0.28	0.01	0.94
1465	Ligament or interphalangeal joint capsule at hand repair	3.09	0.02	1.83
1443	Incision procedures on wrist	0.11	0.07	0.29
1464	Other arthroplasty of the interphalangeal joint of the hand	0.02	0.07	0.03
1446	Synovectomy of the tendon of hand or wrist	0.74	0.11	2.28
1452	Closed reduction of fracture of carp	0.33	0.12	0.54

CODE	Name	Total	Male	Female
1463	Metacarpophalangeal joint arthroplasty	0.07	0.14	0.06
1474	Procedures for hand or wrist lump	0.60	0.14	2.14
1469	Reconstruction procedures on hand	0.54	0.18	0.68
1471	Correction procedure at hand or finger	7.66	0.18	6.65
1442	Incision procedures on wrist	0.25	0.22	0.37
1462	Interphalangeal joint arthroplasty in the hand	0.14	0.28	0.17
1453	Closed reduction of fracture of metacarpus	2.21	0.29	2.00
1447	Fasciectomy for Dupuytren's disease	3.45	0.42	2.85
1470	Reconstruction procedures on wrist	0.16	0.51	0.06
1456	Open reduction of fracture of metacarpus	4.97	0.69	3.54
1459	Open reduction of dislocation of wrist	1.32	0.70	1.54
1441	Incision procedures on a hand bone	0.86	0.88	0.74
1450	Other excision procedures on hand	1.26	0.93	1.26
1451	Other excision procedures on wrist	0.13	1.26	0.17
1460	Hand arthrodesis	1.92	1.28	1.08
1461	Bone graft at the wrist, metacarpal or phalanx	0.29	2.10	0.34
1454	Closed reduction of hand phalanx	2.38	2.25	2.17
1455	Open reduction of fracture of carp	0.79	2.43	1.26
1466	Repair of the tendon of hand	29.82	3.35	23.32
1448	Amputation of wrist, hand or finger	8.04	3.58	9.56
1468	Other repair procedures on hand	0.36	3.78	1.23
1457	Open reduction of fracture of phalanx of hand	12.64	5.28	10.50
1449	Other excision procedures on bone of hand	1.00	7.72	1.31
1472	Correction procedures on the hand	0.02	7.87	0.09
1440	Incision procedures on a muscle, tendon or fascia of hand	9.78	8.57	15.50
1458	Closed reduction of dislocation of hand	0.75	13.09	0.97
1467	Other repair procedures on hand	3.82	31.19	4.05
	Total	100.0	100.0	100.0

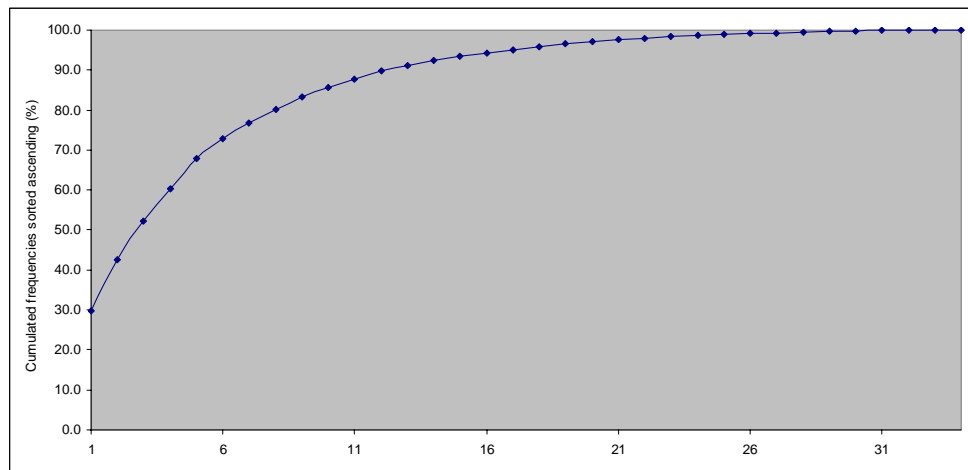


Figure no. 5: Cumulative frequencies calculated after the types of interventions have been previously sorted in ascending order by the relative frequencies

The linear correlation coefficient of data series that represents the number of hand surgery by type of intervention for males and females is equal to 0.92 and indicates a strong dependence between the two data sets. The same conclusion is obtained if we apply ANOVA for which the results are shown in Table 5.

Table no. 5: ANOVA to determine differences between men and women in relation to the distribution of the types of surgical intervention

Source of Variation	SS	df	F	P-value	F crit
Between Groups	2514438	1	5.16	0.03	3.99
Within Groups	32151266	66			
Total	34665704	67			

*Authors computations using Microsoft EXCEL.

Conclusions

In 2012 there were 20086 cases of hand surgery in Romania, which are distributed differently for the male and female persons. There were 16582 male cases which represents 82.6 % of the total number of cases for men and for women there were only 3504 cases that are 17.4 % of total cases. The most common surgery for men in 2012 was "Closed reduction of dislocation of the hand" representing 13.3% and for women "Repair of tendon of hand" which represents 23.3 % of the total. By applying ANOVA we found a significant difference between men and women in the age groups distribution of the number of hand surgery. The biggest differences between the two groups of individuals were recorded in the three age groups between 15-60 years.

Current availability of data does not allow an interconnected analysis of systems to measure the impact of hand surgery interventions on the system of spa treatment in Romania.

Most surgeries can be found in the working age groups, thus largely explaining the cause of the diagnoses that result in the hand surgery. By highlighting this, new research horizons are opened up such as: To what extent hand surgery occur for patients that have mandatory medical insurance or facultative insurance? The support after surgery, treatment and recovery is provided by CNAS, employer or private insurance companies. Is health tourism a burden or an economic development taking into account the possibility of a recovery procedures spa after surgery? In these circumstances the following question arises: is spa tourism a burden or an economic development taking into account the possibility of a spa recovery procedure after surgery?

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