

Cost analysis of total knee arthroplasty surgeries in Turkey

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Background and study aims: While working with increasing costs, hospital enterprises try to develop strategies to provide high quality services. In this study, we intended to perform the cost analysis of total knee arthroplasty.

Materials and Methods: A total of 503 patients who were treated with total knee arthroplasty surgery due to gonarthrosis at Nevşehir State Hospital Orthopedics and Traumatology clinic were included in the study. Procedures performed while the patient is in hospital were analyzed by dividing them into the costs of the implant applied to the patient, surgical procedure, medications used, blood and blood products transfusion, medical tests, anesthesia procedure, bed fee and other applied procedures.

Results: The mean total cost was 7560.2 Turkish Lira (TL). The mean cost of the implant applied to the patient was 4847.7 TL, that of surgical procedure was 1800 TL, medications used 371.1 TL, blood and blood products transfusion 38.7 TL, medical tests 38.3 TL, anesthesia procedures 142.7 TL, bed fee 195.2 TL and other applied procedures 122.9 TL.

Conclusion: In the cost analyses made in this study, it is observed that the share of implant, surgical procedure and anesthesia costs within the total cost is approximately 90%. It is not possible to cut back on the produced procedures in this 90% part and to modify them. To reduce the total cost, it seems most reasonable to focus on the costs of blood and blood products transfusion, medical tests, medications used and bed fees.

Keywords: Cost analysis; total knee arthroplasty; gonarthrosis.

INTRODUCTION

According to the Turkish Statistical Institute data, the ratio of the elderly population in the total population was 8% in 2014, while it rose to 8.8% in 2018. The mean remaining life expectancy of people having reached the age of 65 in Turkey was determined as 17.7 years. The life expectancy was 10.7 years at the age of 75 and 5.9 years at the age of 85¹.

Osteoarthritis (OA) is the most common joint disease and is expected to be the fourth most important cause of disability worldwide by 2020^{2,3}. OA mainly affects knee, hip, hand, facet and foot joints, but knee OA accounts for 83% of total OA^{2,4}. Gonarthrosis is one of the most common knee diseases in the elderly population group and causes pain and disability in the geriatric population⁵. Treatment of osteoarthritis that does not respond to advanced and conservative treatment is total joint arthroplasty. Total knee arthroplasties are among commonly-performed and costly interventional procedures of orthopedic surgeries.

While working with increasing costs, hospital enterprises try to develop strategies to provide high quality services. In this context, cost analysis is vital. Cost analysis in health services can be defined as the measurable monetary value of the production factors spent to enable hospitals to provide these services⁶. It is possible to prepare plans and allocate resources to increase and track the efficiency of health services through cost analysis^{6,7}.

Although there are studies on the costs of total joint arthroplasty in the literature, there are no studies examining these costs in Turkey⁸⁻¹¹. In this study, we intended to perform the cost analysis of total knee arthroplasty in the only public hospital with active orthopedic surgeries in city province which has a population of more than 300,000.

MATERIALS AND METHODS

A total of 503 patients, 91 (18.1%) male and 412 (81.9%) female, who were treated with total knee

Table 1. — Distribution of percentages of total procedures in total cost

	Percentage in total cost (%)
Implant cost	64.1
Surgical procedure cost	23.8
Cost of medications	4.9
Blood and blood products transfusion costs	0.5
Medical tests cost	0.5
Anesthesia cost	1.8
Bed fee cost	2.5
Cost of other applied procedures	1.6

arthroplasty surgery due to gonarthrosis in 2018 and 2019 at Orthopedics and Traumatology clinic were included in the study. This research has been approved by the ethics Committee of the authors' affiliated institutions.

The procedures and the invoices of all patients who underwent total knee arthroplasty were retrospectively analyzed through the system after they were discharged. Procedures performed while the patient is in hospital were analyzed by dividing them into the costs of the implant applied to the patient, surgical procedure, medications used, blood and blood products transfusion, medical tests, anesthesia procedure, bed fee and other applied procedures.

Statistical analyses were performed using the SPSS version 17.0 software package. Descriptive statistics (mean, standard deviation) were used to analyze the data. Quantitative data with normal distribution were compared using Student's t test, and those with skewed distribution were compared using the Mann-Whitney U test. To assess relationships, Pearson's correlation analysis was used for parametric variables and Spearman's correlation analysis was used for non-parametric variables. $p < 0.05$ was considered statistically significant.

RESULTS

The mean age of the patients was 66.1 (50-83). 180 (35.8%) of the patients were operated on the right and 323 (64.2%) were operated on the left knee. 286 of the patients were operated in 2019 and 217 in 2018. The mean total cost was 7560.2 Turkish Lira (TL). The mean cost of the implant applied to the patient was 4847.7 TL, that of surgical procedure was 1800 TL, medications used 371.1 TL, blood and blood

products transfusion 38.7 TL, medical tests 38.3 TL, anesthesia procedures 142.7 TL, bed fee 195.2 TL and other applied procedures 122.9 TL. The total cost of total knee arthroplasty surgeries was determined as 2,162,239.0 TL in 2019 and 1,640,579.9 TL in 2018. Year 2019 €/TL average was determined as 6.35, and the total cost in 2019 was calculated as €340,510 and mean total cost € as 1,190.5. Year 2018 €/TL average was determined as 5.67, and the total cost in 2018 was calculated as €289,343.8 and mean total cost € as 1,333.3.

DISCUSSION

The level of health services used as an indicator of socioeconomic development should be in accordance with international standards, high-quality and low-cost^{12,13}. In this sense, the purpose of cost analysis studies is not only to find the best clinical method, but also to find the lowest cost^{13,14}. In hospitals that need to be managed professionally, performing cost analysis of units will assist managers in decision-making processes^{12,13}. However, hospital managers should never compromise on quality service delivery while trying to cope with increasing costs^{13,15}.

Cost analysis includes studies on the evaluation and interpretation of information regularly obtained from the cost system on various aspects by combining with the information provided from other sources when necessary¹². Cost analysis, which is one of the most important financial management tools used by management accounting, consists of the analyses made in order to help future financial planning by making use of the cost accounting data of previous periods^{12,16}.

Due to limited resources, costs should be evaluated well when making decisions about health economics. More studies are needed on this issue, as there are few studies on economic evaluation. Most of the time, there are political, cultural obstacles, or those related to cost analysis methodologies, in making economic evaluations in decision-making^{13,17}. Cost-effectiveness analysis, one of the most common and well established methods in economic evaluation¹⁸⁻²¹, assesses the value of an intervention strategy relative to an alternative strategy on the basis of cost and both quality and quantity of life¹⁸. Treatment and management of OA involves a multidisciplinary approach and various management options include patient education and self-management, nonpharmacological treatments and pharmacological treatments²². Due to the increase in the number of older people, there has been an increase in the demand for surgical interventions such as joint

arthroplasty which has caused a rise in the costs associated with OA²²⁻²⁵.

In the cost analyses made in this study, it is observed that the share of implant, surgical procedure and anesthesia costs within the total cost is approximately 90%. It is not possible to cutback on the procedures in this 90% part and to modify them. To reduce the total cost, it seems most reasonable to focus on the costs of blood and blood products transfusion, medical tests, medications used and bed fees. They correspond to approximately 8.5% of the total cost. More efficient treatment of patients with preoperative additional diseases can reduce the total length of hospital stay, thus reducing bed fee costs. Costs of medications used, blood and blood products transfusion and medical tests will also decrease in correlation with bed fee cost. In the UK, the total health care cost of osteoarthritis is estimated at over £1 billion (2010 prices)^{22,26}. Based upon national survey data, Kortlarz et al. estimate the increased insurer expenditure for women in the US with osteoarthritis to be \$4,833. For men with osteoarthritis, the additional insurer cost was estimated as \$4,036^{22,27}. There is therefore a need for cost-effective approaches for the management of OA²².

In this study, the mean cost of total knee arthroplasty surgery per person was calculated as €1333-1190 in 2018-2019. The reason for this cost to be very low compared to other studies in the literature seems to be the high €/TL exchange rate. Also, the reason why the mean costs in 2019 and 2018 are different in terms of euro is that the €/TL exchange rate is different for each year.

On the other hand, the total cost of total knee arthroplasty surgeries is approximately 2 million TL per year, which indicates the magnitude of the share of advanced gonarthroses in total health expenses. These costs can be reduced by alleviating obesity, which is one of the most common causes of secondary gonarthrosis in our country. In addition, the frequency of advanced osteoarthritis can be reduced by the appropriate treatment of inflammatory arthritis, intraarticular fractures and diseases such as meniscopathy, which are other causes of osteoarthritis.

Our study has some limitations. First, the fact that the study is single-center is its main limitation. The medications used, the procedures performed and the tests required may vary in different centers. The use of the two-year data in the study is also a limitation. For these reasons, there is a need for multicenter studies with larger numbers of patients that evaluate longer periods in terms of cost analysis.

CONCLUSIONS

The costs of total knee arthroplasties, which are among frequently performed orthopedic surgeries, are quite high and their total costs may be reduced by evaluating the costs of the procedures performed with cost analysis.

Declaration of conflicting interests: the author declared no conflicts of interest with respect to the authorship and/or publication of this article.

Committee approval: Nevşehir Hacı Bektaş Veli University Ethics Committee approval was obtained before the study by number 12/03/2020-08.

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