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Research article

Investigation of hospitalization costs in orthopedics and traumatology clinic

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Abstract

The aim of the study was to analyze inpatient costs in the Orthopedics and Traumatology clinic of a public hospital. The hospitalizations in the Orthopedics and Traumatology clinic of the 525-bed AII group hospital in 2019, 2020 and 2021 were retrospectively evaluated. The study was planned as a cross-sectional descriptive study and data were obtained from the Hospital Management Information System. There were 27,330 inpatients in 2019, 18,604 in 2020 and 21,709 in 2021. The average number of days of hospitalization was 4.07 days in 2019, 2.99 days in 2020 and 2.34 days in 2021. The total annual inpatient cost of Orthopedics and Traumatology service was realized as 3,761,369.20 $ (21,326,963.36 TL) in 2019, 2,061,248.96 $ (14,428,742.72 TL) in 2020 and 1,231,753.09 $ (10,937,967.44 TL) in 2021. The average hospitalization cost of inpatients was 137.63 $ (780.36 TL) in 2019, 110.80 $ (775.60 TL) in 2020 and 56.71 $ (503.58 TL) in 2021. The decrease in total inpatient costs and average cost per patient over the years is a result of the Covid-19 pandemic. In calculating costs for cost control in hospitals, it is important to investigate the reasons for the change in costs over time as well as revealing the current situation. It is recommended to investigate the sources of changes in costs in future research.

Keywords: *Cost; hospitalization; orthopedics; traumatology*

1. Introduction

Effective use of limited resources is an important requirement for the improvement of health services. The cost of services provided in hospitals, which constitute the main axis of health service production, is quite high (Top and Aslan, 2017; Berk and Cercioglu, 2019). In order for costs to be used as an effective tool for increasing efficiency in health services, they must be detectable and auditable. In this direction, it is important to develop cost accounting systems in hospitals (Elif et al., 2015). Hospital-wide or clinic-based cost calculations serve the purpose of developing cost accounting systems.

Due to the increase in costs and limited resources in health service delivery, hospitals face financial difficulties. Therefore, the cost-effectiveness and efficiency of hospitals are closely monitored by both health care providers and health policy makers (Canbaz et al., 2015). However, hospitals consume a lot of resources as they are the institutions with the largest proportion of health service delivery. Costs are the main factor in terms of effective and efficient use of resources, directly affecting the provision of quality, efficient and timely healthcare (Carikci and Acar, 2017; Dirvar et al., 2020). In addition, it is important for decision makers how the Covid-19 pandemic, which has affected the whole world, has caused a change in healthcare resources. Therefore, decision makers can use this information to understand resource consumption in hospitals and both disease- and clinic-based costs, and to plan budget and resource allocation (Hussey et al., 2009).

Public hospitals play an important role in ensuring access to health services in the country and in protecting and improving

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public health. The costs of healthcare services offered in hospitals, including diagnosis, treatment, health education, surgery, birth, rehabilitation, and the protection and development of health, are quite high. High costs incurred in the clinics of these hospitals can become a factor limiting access to healthcare. In addition, personnel, medicine, serum, vaccine and medical consumables are among the important cost items in hospitals. As a matter of fact, many studies have found that personnel costs are the highest cost item (Yigit et al., 2003; Karasioglu and Cam, 2008; Esatoglu et al., 2010; Ozkan et al., 2014; Elif et al., 2015; Soylular and Agirbas, 2016; Buluc and Agirbas, 2017). In this context, it is possible to list the cost items in hospitals as follows: direct raw materials and materials, direct personnel and general production expenses (Esatoglu et al., 2010).

Systematic and continuous cost management is important in hospitals to optimize resource consumption and provide quality, effective and efficient healthcare. Cost management essentially focuses on planning, management and control of costs to achieve maximum benefit at minimum cost (Otlu and Karaca, 2005). As a matter of fact, cost information has a performance-enhancing effect for healthcare professionals (Cinquini et al., 2009). One of the cornerstones of cost management is "cost accounting". Cost accounting is an accounting and recording system that allows determining and monitoring the cost types that make up the cost of produced goods or services. Under cost accounting, which consists of recording and measurement systems, measurements are made with approaches such as traditional cost analysis, activity-based costing, order costing, phase costing, full costing, variable costing, actual costing and standard costing (Palteki, 2019). Depending on the scope of the research, performing cost analyzes with one of these methods is important for the management of increasing costs.

Reducing costs, especially in high-cost surgical clinics such as Orthopedics and Traumatology, will also facilitate access to healthcare. The costs of patients in surgical clinics may vary depending on factors such as the patient's diagnosis, interventional procedures and treatment method. High-cost treatment methods are known as factors that increase costs. Many studies in the literature focus on the medical and surgical treatment costs of diseases in the field of Orthopedics and Traumatology. These studies have helped to identify cost-effective treatment methods for clinicians. The aim of this study is to examine inpatient costs in the Orthopedics and Traumatology clinic of a public hospital.

2. Materials and methods

The aim of this study is to examine inpatient costs in the Orthopedics and Traumatology clinic of a public hospital. The study was conducted in the Orthopedics and Traumatology clinic of a 525-bed public hospital serving in the A2 service role in the Mediterranean Region in Turkey. A-II Group Hospitals are general hospitals operating in provinces in Turkey that have the status of regional health centers or in provinces affiliated to these centers and do not have education-research status. AII group hospitals meet the following criteria: second level, inpatient health facility status; having 6 or more specialist physicians from each of at least four branches (internal medicine, general surgery, gynecology and obstetrics, pediatrics) and being able to organize separate emergency and branch shifts; being able to provide follow-up and treatment of high-risk patients by hospitalization; having a Level III Emergency Service and a Level III intensive care unit; meeting the necessary examination and treatment services and imaging requirements (Ministry of Health, 2009).

The study was planned as a single-center, cross-sectional descriptive study, and all hospitalizations that occurred retrospectively between 01.01.2019-31.12.2021 were included in the study, and outpatients were excluded. The research period was determined as 2019-2021 because of make a more up-to-date comparison between costs and to see the results of the Covid-19 effect on costs.

Hospitalization costs were calculated based on the perspective of the reimbursement institution. From the perspective of the reimbursement institution, the hospitalization cost calculation includes the medical care costs paid by the reimbursement institution in exchange for the health care provided in this unit. Accordingly, the scope of the research is to examine the transaction costs incurred on patients hospitalized in the Orthopedics and Traumatology clinics of the relevant hospital. Thus, the cost of patients receiving inpatient treatment in the clinic will be determined. Data extracted from HMIS were examined on the basis of patient, procedure and diagnosis.

Cost findings are also calculated in US dollars according to the annual average effective selling rate of the Central Bank of the Republic of Turkey (1 $=5.67 TL in 2019 1 $=7.00 TL in 2020; 1 $=8.88 TL in 2021 (TCMB, 2023). M.S. Excel program was used for data analysis.

2.1. Research data

Data were obtained through the Hospital Management Information System (HMIS) of the relevant hospital, and the age, gender, diagnosis, number of days of hospitalization and detailed invoices of the inpatients in the relevant period were evaluated.

2.2. Institutional authorization

Institutional permission was obtained for the conduct of the study (19.12.2022/E71713619/11909), scientific, ethical and citation rules were followed in the writing process of the study; no falsification was made on the collected data and this study was not sent to any other academic publication environment for evaluation, and it was conducted in accordance with the principles of the Declaration of Helsinki.

2.3. Limitations

This research should be evaluated within the framework of certain limitations. The scope of the research is to calculate the cost of patients receiving inpatient treatment in the Orthopedics and Traumatology service of the relevant hospital from the perspective of the reimbursement institution. The cost calculation only covers the procedures applied to patients, and the lack of grouping such as direct raw material and materials, direct personnel and general production expenses is a limitation of the study. As a matter of fact, in this study, a detailed cost analysis such as traditional cost analysis or activity-based costing was not performed, and the costs of inpatient treatment in the relevant clinic were calculated on a transaction basis. In this context, it was not grouping in cost calculation. Additionally, due to the scope of the data obtained in the study,

the cost of inpatient treatment applied in the relevant clinic was calculated, and no classification was made according to sub-treatment methods. In addition, the inflation difference was not taken in the years in which the study was conducted.

3. Results and discussion

Within the scope of the research, 27,330 inpatients were treated in 2019, 18,604 in 2020 and 21,709 in 2021. The average age of these patients was 53.09 (0-21) in 2019, 52.63 (0-102) in 2020 and 53.44 (0-103) in 2021. In 2019, 58.35% of hospitalized patients were female and 41.65% were male; in 2020, 58.81% of hospitalized patients were female and 41.19% were male; and in 2021, 61.33% of hospitalized patients were female and 38.67% were male. The average number of days of hospitalization was 4.07 days in 2019, 2.99 days in 2020 and 2.34 days in 2021 (Table 1).

Table 1
Descriptive statistics.

		2019	2020	2021
Number of patients		27,330	18,604	21,709
Gender	**Male**	11,384	7,663	8,394
	Female	15,946	10,941	13,315
Average Age		53.09 (0-21)	52.63 (0-102)	53.44 (0-103)
Hospitalization day		4.07	2.99	2.34

Orthopedics and Traumatology service hospitalization costs are presented in Table 2. The total cost of hospitalization was 3,761,369.20 $ (21,326,963.36 TL) in 2019, 2,061,248.96 $ (14,428,742.72 TL) in 2020 and 1,231,753.09 $ (10,937,967.44 TL) in 2021. The average hospitalization cost of inpatients was 137.63 $ (780.36 TL) in 2019, 110.80 $ (775.60 TL) in 2020 and 56.71 $ (503.58 TL) in 2021. Details of hospitalization costs were analyzed based on the procedures performed on patients. In this context, the most billed expense item in 2019 was "graftless umbilical hernia repair" with a total cost of 1,874,980.25 $ (23,240 times, unit price: 80.68 $), "intra-articular injection, pain treatment" with a total cost of 50,180.53 $ (10,129 times, unit price: 4.95 $), and "plaster removal" with a total cost of 11,922.15 $ (5,719 times, unit price: 2.08 $). The most billed expense item in 2020 was "daily bed charge" with a total cost of 25,118.69 $ (16,541 times, unit price: 1.52 $), "intra-articular injection, pain treatment" with a total cost of 30,004.13 $ (7,477 times, unit price: 4.01 $), and "plaster removal" with a total cost of 6,620.89 $ (3,921 times, unit price: 1.69 $). The most billed expense item in 2021 was "daily bed charge" with a total cost of 23,487.47 $ (19,444 times, unit price: 1.21 $), "intra-articular injection, pain treatment" with a total cost of 35,546.62 $ (11,136 times, unit price: 3.19 $), and "plaster removal" with a total cost of 5,717.93 $ (4,257 times, unit price: 1.34 $).

Table 2
Orthopedics and Traumatology clinic hospitalization cost.

	2019	2020	2021
Total cost of hospitalization	3,761,369.20 $ (21,326,963.36 TL)	2,061,248.96 $ (14,428,742.72 TL)	1,231,753.09 $ (10,937,967.44 TL)
The average hospitalization cost	137.63 $ (780.36 TL)	110.80 $ (775.60 TL)	56.71 $ (503.58 TL)

Orthopedics and Traumatology clinic inpatient costs were analyzed based on ICD.10 (International Classification of Disease 10) diagnosis classification. In this context, 2,777 inpatients with different diagnoses were treated in the relevant service in 1,938 in 2020 and 2,296 in 2021. In 2019, the most common diagnosis was "M17.0-Primary gonarthrosis, bilateral". In 2019, 7.79% (2,129 people) of inpatients received this diagnosis and the total annual cost was 331,842.44 $ (1.881.546,66 TL). Second most common diagnosis was "M17-Gonarthrosis (arthrosis of the knee joint)" with total annual cost: 113,535.48 $ (643,746.19 TL) and third was "M19.8-Arthroses other, defined" with total annual cost: 26,389.15 $ (149,626.47 TL). In 2020, the most common diagnosis was "M17.0-Primary gonarthrosis, bilateral", which was seen in 8.69% of patients. The total annual cost of the diagnosis was realized as 170,075.73 $ (1,190,530.11 TL). Second and third most common diagnosis was "M77.3-Calcaneal spur" with total annual cost: 528,779.65 $ (3,701,457.53 TL) and "M19.8-Arthroses other, defined" with total annual cost: 24,850.79 $ (173,955.50 TL) respectively. In 2021, the most common diagnosis was "M17.0-Primary gonarthrosis, bilateral", which was seen in 11.16% of patients. The total annual cost of the diagnosis was determined to be 94,404.66 $ (838,313.38 TL). Second and third most common diagnosis was "M19.8-Arthroses other, defined" with total annual cost: 26,212.74 $ (232,769.09 TL) and "M17.9-Gonarthrosis, unspecified" with total annual cost: 23,818.97 $ (211,512.43 TL) respectively.

When the diagnosis with the highest annual total cost was analyzed, it was determined that the diagnosis seen in 994 patients in 2019 was "M77.3-Calcaneal spur". The rate of this diagnosis in total annual inpatient costs was 12.21% [458,957.14 $ (2,602,286.99 TL)]. In this year, this is followed by "M17.0-Primary gonarthrosis, bilateral" with total annual cost: 331,842.44 $ (1,881,546.66 TL) and "M17-Gonarthrosis (arthrosis of the knee joint)" with total annual cost: 113,535.48 $ (643,746.19 TL). In 2020, the diagnosis with the highest total cost was "M77.3-Calcaneal spur" seen in 1293 patients. The proportion of hospitalizations due to calcaneal spur in total annual inpatient costs was 25.64% [528,779.65 $ (3,701,457.53 TL)]. This is followed by "M17.0-Primary gonarthrosis, bilateral" with total annual cost: 170,075.73 $ (1,190,530.11 TL) and "S46.0-Shoulder rotator cuff tendon injury" with total annual cost: 87,518.14 $ (612,626.95 TL) respectively. The diagnosis with the highest annual total cost was "S46.0-Shoulder rotator cuff tendon injury" in 2021 with total annual cost: 99,276.75 $ (881,577.57 TL). This is followed by "M17.0-Primary gonarthrosis, bilateral" with total annual cost: 94.404,66 $ (838,313.38 TL) and "M17.1-Other primary gonarthrosis" with total annual cost: 53,876.18 $ (478,420.52 TL)) respectively.

In the study, patient hospitalization costs in the Orthopedics and Traumatology clinic of a public hospital were examined. Within the scope of the research, the number of patients hospitalized in the Orthopedics and Traumatology clinic decreased from 2019 to 2020 and increased from 2020 to 2021. This decrease in the number of patients is due to the Covid-19 pandemic. The fact that the Covid-19 pandemic started to be seen in Turkey in 2020 resulted in an increase in the demand for healthcare services in areas other than Covid-19 and urgent/non-emergency healthcare needs during this period (Genc, 2020; Sadyrbaeva and Chekirov, 2022).

In this context, as in other specialties, there has been a significant decrease in the number of inpatients in the field of Orthopedics and Traumatology. Anticipating and responding to

Covid-19 patients in need of hospital-based care, many countries have redesigned hospital discharge policies and delayed planned admissions for non-emergency care.

As a result, in many countries, total inpatient admissions declined between 2019 and 2020. In 2021, there was relatively greater adaptation to the Covid-19 pandemic, and deferred healthcare services translated into demand, resulting in increased inpatient admissions. This explains the increase in the number of inpatients from 2020 to 2021 (Azzolina et al., 2022; Chiba et al., 2023).

It is seen that the average age of the patients hospitalized in the relevant clinic was close in all years (≈53). Considering the gender distribution of the patients, it was determined that mostly female patients received inpatient treatment and the proportion of female patients receiving treatment increased over the years.

The average number of days of hospitalization decreased significantly over the years (from 4.07 days to 2.34 days). It is thought that this decrease in the number of hospitalization days is due to the fact that patients who received inpatient treatment in hospitals during the Covid-19 pandemic period were discharged as quickly as possible.

When the total annual inpatient cost in Orthopedics and Traumatology service is analyzed, a decrease occurred from 2019 to 2021 [2019: 3,761,369.20 $ (21,326,963.36 TL); 2020: 2,061,248.96 $ (14,428,742.72 TL); 2021: 1,231,753.09 $ (10,937,967.44 TL)]. This is seen as a natural consequence of the decreasing number of inpatients. While the average hospitalization costs per patient were close in 2019 and 2020, there was a significant decrease in 2021 [2019: 137.63 $ (780.36 TL); 2020: 110.80 $ (775.60 TL); 2021: 56.71 $ (503.58 TL)].

Kizilcec (2012) examined the inpatient costs in Cerrahpasa Medical Faculty Hospital in 2011 and concluded that the annual number of inpatients in the Orthopedics Clinic was 300 and the average hospitalization cost per patient was 24,598.44 TL (≈ 13,912.36 $). Yigit et al. (2003), in their research, found that the average cost per patient of the Orthopedics and Traumatology Service in 2002 was 1,201,789.837 TL (≈ 684,853.50 $). Elif et al (2015) conducted a branch-based cost analysis study in a public hospital and concluded that the annual number of inpatients in the orthopedics clinic was 205 and the average hospitalization cost per patient was 2,006.62 TL (≈736,374$). Sonsuz (2011) calculated the total cost of an Orthopedic clinic in a private hospital as 609,740.65 TL (≈369,898.48$) in 2009. Yilmaz (2018) determined that the total cost of the Orthopedics and Traumatology clinic in a public hospital was 361,215.60 TL (≈95,592,56$). Dogan (2022) determined that the total clinical cost of Orthopedics and Traumatology in a training and research hospital is 18,537,653.65 TL (≈3,410,028.93$) in 2019. Soylular and Agirbas (2016) determined in their research that the Orthopedics and Traumatology clinic is among the high-cost units. In this context, it is thought that the difference between the findings of this study and the findings of other studies may be due to the different types of hospitals where the studies were conducted.

As a matter of fact, this research was conducted in an AII group general hospital. Study of Kizilcec (2012) was conducted in a university hospital, while study of Elif et al. (2015) in a training and research hospital. Since these hospitals provide education services, it is considered normal that inpatient error costs are high (Kisakurek, 2010; Sonsuz, 2011; Ozkan et al., 2014; Ozkan and Agirbas, 2015; Buluc and Agirbas, 2017; Mut and Agirbas, 2017; Yilmaz, 2018; Dogan, 2022).

When the research findings were analyzed within the scope of expense items, it was determined that the most billed expense item was “Intra-articular injection, pain treatment” in 2019, while it was “Daily bed charge” in 2020 and 2021. It is thought that the reason for this situation is that orthopedic diseases are very painful and intra-articular injection treatment is often preferred in pain treatment. Based on the diagnosis-based inpatient cost findings, the most common diagnosis was “M17.0-Primary gonarthrosis, bilateral” in 2019, while it was “M19.8-Arthroses other, defined” in 2020 and 2021. The diagnosis type with the highest share in the total annual cost was “M77.3-Calcaneal spur” in 2019 and 2020 and “S46.0-Shoulder rotator cuff tendon injury” in 2021. Shoulder rotator cuff tendon injury is one of the most common orthopedic conditions (Bilen, 2016).

4. Conclusion

Musculoskeletal system diseases, which are included in the field of orthopedics, stand out as very common health problems today. Therefore, research on the cost of orthopedic clinics is important. Examining the cost of healthcare provided in public hospitals can have a significant impact on patients’ access to healthcare.

It is thought that the results of the research will provide valuable information for resource planning and cost analysis in hospital clinics. Based on the research findings, it was revealed that the number of patients hospitalized in orthopedics clinics decreased during the pandemic period. It is thought that this situation is caused by the health problems that were postponed due to the effect of the pandemic and the short hospitalizations in the hospitals.

There was also a significant decrease in the average cost of hospitalization per patient. The decrease observed is generally evaluated positively in terms of cost control. It is also important to calculate the costs for cost control in hospitals, to reveal the current situation, and to investigate the reasons for the change in costs. This is the limitation of this research. In future research on this subject, it is also recommended to investigate what causes the change in costs.

Hospital managers and policymakers should take precautions considering that hospital visits postponed due to the pandemic will increase further in the coming years and this will create an additional burden on the health system. In order to monitor and control costs, it is important to establish a cost accounting system in hospitals, to make regular cost division and unit cost analyses, and to use the analysis results in managerial decisions.

Conflict of interest: The authors declare that they have no conflict of interests.

Informed consent: The authors declare that this manuscript did not involve human or animal participants and informed consent was not collected.

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