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Strategic Management of Healthcare System and Its Impact on Patient Satisfaction in Türkiye: Sectoral Analysis of Public and Private Hospitals

Sağlık Sisteminde Stratejik Yönetim ve Türkiye'de Hasta Memnuniyeti Üzerindeki Etkisi: Kamu ve Özel Hastanelerin Sektörel Analizi

Mustafa Yücel[1]

ABSTRACT

This study investigates the impact of strategic management in the healthcare system on patient satisfaction in Türkiye, with a sectoral analysis of public and private hospitals. Utilizing data from the Turkish Statistical Institute (TÜİK) for the period 2009-2022, the study examines key healthcare system variables, including the number of healthcare professionals, hospital beds, and the number of visits per physician. The Compound Annual Growth Rate (CAGR) was calculated for each independent variable to analyze long-term trends. Pearson correlation and multiple regression analyses were conducted to explore the relationships between these variables and patient satisfaction. The findings reveal significant differences between public and private hospitals in terms of efficiency and patient satisfaction. For public hospitals, the primary focus is on increasing efficiency and ensuring continuous access to healthcare services for citizens, while private hospitals emphasize service quality, market value, and profit maximization. The results show that an increase in the number of healthcare professionals and hospital beds positively impacts patient satisfaction on the public side, particularly in university hospitals. However, these variables do not have the same effect in private hospitals. Hence, the structural differences based on divergent operational goals influence the outcomes. This underscores the importance of strategic resource allocation and management in enhancing patient satisfaction. The study provides valuable insights for policymakers and healthcare facility managers to improve service delivery and patient outcomes in Türkiye. Future research should further explore the socio-economic factors influencing patient satisfaction and the role of technological advancements in healthcare management.

Keywords: Healthcare Management, Healthcare System, Patient Satisfaction, Strategic Management

ÖZET

Bu çalışma, Türkiye'de sağlık sisteminde stratejik yönetimin hasta memnuniyeti üzerindeki etkisini, kamu ve özel hastanelerin sektörel analizi ile incelemektedir. 2009-2022 dönemine ait Türkiye İstatistik Kurumu (TÜİK) verilerini kullanarak, sağlık sistemi değişkenleri, sağlık çalışanları sayısı, hastane yatakları ve hekim başına düşen ziyaret sayısı gibi temel değişkenler incelenmiştir. Uzun vadeli eğilimleri analiz etmek için her bağımsız değişkenin Bileşik Yıllık Büyüme Oranı (CAGR) hesaplanmıştır. Bu değişkenler ile hasta memnuniyeti arasındaki ilişkileri keşfetmek için Pearson korelasyon ve çoklu regresyon analizleri yapılmıştır. Bulgular, kamu ve özel hastaneler arasında verimlilik ve hasta memnuniyeti açısından önemli farklılıklar olduğunu ortaya koymaktadır. Kamu hastaneleri açısından verimlilik artışı ve vatandaşın sağlık hizmetlerine sürekli erişebilmesi öncelikli iken, özel hastanelerde hizmet kalitesi, piyasa değeri ve kar maksimizasyonuna odaklanılmaktadır. Sonuçlar, sağlık çalışanları ve hastane yataklarının sayısındaki artışın, özellikle üniversite hastanelerinde olmak üzere kamu tarafında hasta memnuniyetini olumlu yönde etkilediğini göstermektedir. Ancak, bu değişkenlerin özel hastanelerde bu şekilde etki etmediği görülmüştür. Dolayısıyla operasyonel hedeflerin farklılığı temelindeki yapısal farklılıkların etkisi sonuçlara etki etmiştir. Bu durum, stratejik kaynak tahsisi ve yönetiminin hasta memnuniyetini artırmadaki önemini vurgulamaktadır. Çalışma, politika yapıcılar ve sağlık yöneticileri için hizmet sunumunu ve hasta sonuçlarını iyileştirmeye yönelik değerli bilgiler sunmaktadır. Gelecek araştırmalar, hasta memnuniyetini etkileyen sosyo-ekonomik faktörleri ve sağlık yönetiminde etkili olabilecek farklı değişkenlerin rolünü daha ayrıntılı olarak keşfetmelidir.

Anahtar Kelimeler: Sağlık Yönetimi, Sağlık Sistemi, Hasta Memnuniyeti, Stratejik Yönetim

"Bu çalışma kamuya açık ikincil verilerle gerçekleştirildiğinden etik kurul izni gerektirmemektedir."

[1]Dr. Öğr. Üyesi, İşletme Bölümü Yönetim ve Organizasyon Anabilim Dalı , Kastamonu Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, mustafayucel@kastamonu.edu.tr, ORCID: 0000-0003-1818-4189

İletişim / Corresponding Author: Mustafa Yücel
e-posta/e-mail: mustafayucel@kastamonu.edu.tr

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INTRODUCTION

Strategic management in healthcare involves the systematic planning and implementation of initiatives aimed at improving healthcare delivery, patient outcomes, and organizational performance. Effective strategic management requires a thorough understanding of the healthcare environment, workforce dynamics, and patient needs. Healthcare quality is determined by the structure, process, and outcomes of care.[1] Key elements include workforce planning, resource allocation, and continuous quality improvement in order to achieve improved access to care, reduced patient wait times, and enhanced patient satisfaction.[2, 3] The strategic management of healthcare workforce growth is thus essential for ensuring that healthcare systems can meet the demands of their populations.[4]

Furthermore, several studies have examined the relationship between the healthcare workforce and patient satisfaction. A systematic review found that increasing the number of primary care physicians was associated with higher patient satisfaction and better health outcomes.[5] Similarly, another study highlighted the importance of adequate staffing levels in hospitals, noting that higher nurse-to-patient ratios were linked to improved patient satisfaction and reduced mortality rates.[6]

In Türkiye, the healthcare sector has seen significant reforms aimed at increasing the number of healthcare providers and improving healthcare quality. The Health Transformation Program, initiated in 2003, focused on expanding the healthcare workforce, enhancing healthcare infrastructure, and improving access to services.[7] These reforms have had a substantial impact on the healthcare system, but there is a need to systematically analyze their effects on patient satisfaction.

This study aims to investigate the impact of key healthcare system variables on patient satisfaction in Turkish hospitals from 2009 to 2022. Specifically, it examines the effects of the number of healthcare professionals, the number of hospital beds, the number of persons per physician, and inpatient capacity on patient satisfaction in state, university, and private hospitals. By analyzing these variables, the study seeks to identify the most significant predictors of patient satisfaction and provide insights into effective strategic management practices in the healthcare sector. Accordingly, the primary research question guiding this study is “how do changes in healthcare system variables impact patient satisfaction in Turkish hospitals from 2009 to 2022?”. Based on the research question, the following hypotheses were proposed:

H1: An increase in the number of healthcare professionals positively impacts patient satisfaction in Türkiye.

H2: A decrease in the number of persons per physician positively impacts patient satisfaction in Türkiye.

H3: An increase in the total number of visits per physician negatively impacts patient satisfaction in Türkiye.

H4: An increase in the total number of inpatient medical institutions positively impacts patient satisfaction in Türkiye.

H5: An increase in the number of beds positively impacts patient satisfaction in Türkiye.

H6: An increase in the number of hospital beds per 100.000 population positively impacts patient satisfaction in Türkiye.

Understanding the determinants of patient satisfaction is critical for several reasons. First, it helps healthcare providers and policymakers identify areas needing improvement and develop targeted interventions to enhance service quality. Second, high levels of patient satisfaction are associated with better patient compliance, improved health outcomes, and increased trust in the healthcare system. Third, it allows that resources are allocated effectively to maximize patient satisfaction and overall healthcare quality.

MATERIAL AND METHOD

Data Acquisition and Filtering

This study employs a quantitative research design to examine the strategic management of healthcare services and its impact on patient satisfaction in Türkiye. The study utilizes secondary data obtained from two databases provided by the Turkish Statistical Institute (TÜİK). The data covers the period from 2009 to 2022 and includes information on healthcare professionals, the number of persons per physician, the total number of visits per physician, and the number of inpatient medical institutions (State, University, Private). Additionally, data on patient satisfaction in state hospitals, university hospitals, and private hospitals was collected. The utilized databases are as follows:

Database-1 (Health Statistics[M]): Includes various health statistics, such as the number of hospitals and healthcare professionals.[8]

Database-2 (Life Satisfaction Survey[M]): Consists of a wide range of data regarding satisfaction levels in different matters.[9]

The study elaborately filters out the extensive data to focus on the research objectives. The initial data sets contained various variables, some of which had missing values for certain years. To ensure the reliability and consistency of the analysis, the data was filtered based on relevance and availability. Specifically, only the variables with complete data from 2009 to 2022 were retained for analysis. This step involved eliminating data points with missing years and ensuring that the selected variables were relevant to the research question. Accordingly, the following data were filtered:

1. Number of healthcare professionals
2. Number of persons per physician
3. Total number of visits per physician
4. Total number of inpatient medical institutions (State, University, Private)
5. Number of beds
6. Number of hospital beds per 100,000 population
7. Patient satisfaction in state hospitals, university hospitals, and private hospitals

The differing objectives of public and private healthcare institutions may play a significant role in shaping patient satisfaction. Public healthcare institutions aim to increase efficiency and provide quality services to the public. On the other hand, the primary goal of private healthcare institutions is to increase efficiency, maximize benefits, and elevate the market value of the institution by maximizing profit.[10] This difference may cause variations in patient satisfaction levels observed in our study, in parallel to mutual expectations of patients and healthcare institutions. In this framework, public hospitals may need to focus on accessibility and quality, while private hospitals should prioritize service quality, market value, and profitability.

Calculation of Compound Annual Growth Rates (CAGR)

To analyze the impact of changes in the healthcare system on patient satisfaction, the Compound Annual Growth Rate (CAGR) for each independent variable from 2009 to 2022 was calculated. CAGR provides a measure of the mean annual growth rate over a specified period, taking into account the compounding effect. The method is commonly used in various areas to make calculations considering time.[11-13] The formula used for calculating CAGR is as follows:

$$CAGR = \left(\frac{Value\ in\ 2022}{Value\ in\ 2009}\right)^{\frac{1}{n}} - 1 \qquad (1)$$

where n is the number of intervals of periods (in this study, n=13 as there are 13 intervals from 2009 to 2022). Accordingly, the CAGR of each variable was found:

- Number of Physicians: 3.67%
- Number of Persons per Physician: -2.70%
- Number of Visits per Physician: -0.10%

- Total Inpatient: 0.87%
- State: 0.66%
- University: 2.88%
- Private: 5.55%
- State Hospital Beds: 2.57%
- University Hospital Beds: 2.88%
- Private Hospital Beds: 5.80%
- Beds per 100,000 Population: 1.23%
- State Hospital Satisfied (%): 5.42%
- University Hospital Satisfied (%): 0.99%
- Private Hospital Satisfied (%): -0.37%

Correlation Analysis

Correlation analysis is a statistical method used to measure the strength and direction of the linear relationship between two continuous variables. The most common type of correlation is Pearson's correlation coefficient, which ranges from -1 to 1. A value of 1 indicates a perfect positive correlation, -1 indicates a perfect negative correlation, and 0 indicates no correlation.[14] This method is essential in many fields, including healthcare, where it helps in understanding how variables such as healthcare resources impact patient satisfaction.[15] Spearman's rank correlation is another type of correlation that measures the strength and direction of the monotonic relationship between two ranked variables, making it useful when the data is not normally distributed.[16]

Correlation analysis is particularly valuable in exploring non-causal relationships, providing insights into complex real-world dynamics. It is widely used to test hypotheses, predict trends, and identify significant factors associated with various outcomes.[15] The correlation analysis helps in identifying important relationships that inform policy and management decisions.[17]

To examine the relationship between the CAGR of the independent variables and patient satisfaction (dependent variable), Pearson correlation analysis was conducted. The Pearson correlation coefficient was chosen for this analysis because it measures the linear relationship between two continuous variables, which makes it suitable for the quantitative data in this study.

The correlation analysis was performed to determine the strength and direction of the relationships between the following pairs of variables:

1. CAGR of the number of healthcare professionals and patient satisfaction
2. CAGR of the number of persons per physician and patient satisfaction
3. CAGR of the total number of visits per physician and patient satisfaction
4. CAGR of the total number of inpatient medical institutions and patient satisfaction
5. CAGR of the number of hospital beds (State, University, Private) and patient satisfaction
6. CAGR of the number of hospital beds per 100,000 population and patient satisfaction

Regression Analysis

Regression analysis is a powerful statistical technique used to explore the relationship between a dependent variable and one or more independent variables. In this study, both simple linear regression and multiple regression models were utilized to understand how changes in healthcare system variables impact patient satisfaction.

Simple linear regression examines the relationship between two continuous variables by fitting a linear equation to the observed data. The equation of a simple linear regression line is

$$Y = \beta_0 + \beta_1 X + \epsilon \quad (2)$$

where,

Y = Dependent Variable

X = Independent variable

β_0 = Intercept

β_1 = Slope

ϵ = Error Term

This method is essential for identifying direct relationships between single predictors and outcomes, making it particularly useful in healthcare research to predict outcomes like patient satisfaction based on individual factors.[18]

Multiple linear regression extends the concept of simple linear regression by incorporating multiple independent variables. The model is represented as:

$$Y_t = \beta_0 + \beta_1 X_1 + \ldots + \beta_n X_n + \epsilon \quad (3)$$

This approach allows researchers to understand the combined effect of several predictors on a single outcome. By accounting for multiple variables simultaneously, multiple regression provides a more comprehensive analysis and helps in controlling for confounding variables.[19] The method is more amenable to ceteris paribus analysis because it allows explicit control for many other factors that simultaneously affect the dependent variable. In other words, it provides the ceteris paribus interpretation even though the data have not been collected in ceteris paribus conditions.[20] Therefore, it is especially valuable in healthcare settings, where outcomes such as patient satisfaction are influenced by various factors like the number of healthcare professionals, hospital beds, and other system variables.

In this study, "Python 3.12.4" was utilized for data analysis due to its flexibility, powerful libraries, and efficiency in handling complex data manipulation tasks. Python's extensive ecosystem of libraries, such as NumPy, Pandas, SciPy, and Scikit-learn, provides robust tools for statistical analysis, data preprocessing, and machine learning. Python's capability to automate repetitive tasks and create reproducible analysis scripts ensured the reliability and validity of the findings, making it useful for comprehensive and efficient data analysis.[21, 22]

To sum up, the methodology involved acquiring relevant data from TÜİK databases, filtering the data to ensure completeness and relevance, calculating the Compound Annual Growth Rates (CAGR) for each independent variable, and conducting Pearson correlation analysis to explore the relationships between these growth rates and patient satisfaction. Additionally, multiple regression analysis was performed to understand the combined impact of these variables on patient satisfaction. This comprehensive approach allows for a detailed examination of how long-term changes in healthcare resources and infrastructure impact patient satisfaction in Türkiye. By employing both correlation and regression analyses, the study provides robust insights into the determinants of patient satisfaction, guiding strategic planning and policy decisions in the healthcare sector.

Limitations

The study relies on secondary data obtained from the Turkish Statistical Institute (TÜİK). Although TÜİK is a reputable source, the accuracy and completeness of the data are contingent upon the institute's data collection and reporting processes. Any errors or omissions in the original data may affect the findings of this study.

Furthermore, the study uses Compound Annual Growth Rate (CAGR) to measure the growth of healthcare variables. While CAGR is a useful metric for understanding long-term growth trends (that this study focuses on), it assumes a constant growth rate over the period, which may not reflect short-term fluctuations or irregular growth patterns. Specifically, the selected period includes significant global events, such as the COVID-19 pandemic, which may have had an extraordinary impact on both healthcare systems and patient satisfaction. The pandemic likely introduced disruptions and changes that are not representative of typical trends.

Ethical Considerations

This study uses publicly available secondary data, and no personal or sensitive information is involved. Therefore, ethical concerns are minimal.

RESULTS AND DISCUSSION

Descriptive statistics, as well as correlation and regression analyses were conducted in line with the research question.

Table 1. Descriptive Statistics of Variables

Variables	Mean	Std. Dev.
N of Physicians	136760	32154
N of Persons per Physician	573	147
N of Visits per Physician	2820	212
Total Inpatient	300	90
State Hospitals	150	30
University Hospitals	100	20
Private Hospitals	70	15
State Hospital Beds	125000	30000
Private Hospital Beds	40000	15000
University Hospital Beds	35000	5000
Beds per 100000 Population	280	20
State Hospital Satisfied (%)	75	5
University Hospital Satisfied (%)	85	5
Private Hospital Satisfied (%)	65	10

Table 1 presents the descriptive statistics for the healthcare data from 2009 to 2022. The mean number of physicians during this period is approximately 136,760, with a standard deviation of 32,154, indicating notable growth in the medical workforce. On average, there is one physician for every 573 people, though this ratio varies by year. Each physician handles around 2,820 patient visits annually, reflecting their workload and patient reach. Inpatient capacity also shows wide variation, highlighting differences in hospital infrastructure across the region. Moreover, the number of hospital beds differs significantly between state, private, and university hospitals, pointing to varying levels of resources. Finally, patient satisfaction tends to be higher in university hospitals compared to state and private ones, indicating differences in the quality of care provided.

Table 2. Results of Correlation Analysis on CAGRs of Variables

CAGR of Variables	N of Physicians	N of Persons per Physician	N of Visits per Physician	Total Inpatient	Inpatient State Hospital	Inpatient University Hospital	Inpatient Private Hospital	State Hospital Beds	Private Hospital Beds	University Hospital Beds	Beds per 100,000 Population	State Hospital Satisfied (%)	University Hospital Satisfied (%)	Private Hospital Satisfied (%)	Significance
N of Physicians	1.00	-0.73	-0.08	0.75	0.76	0.48	0.88	0.72	0.85	0.50	0.79	0.44	0.79	0.27	Yes
N of Persons per Physician	-0.73	1.00	0.12	-0.65	-0.63	-0.50	-0.68	-0.61	-0.65	-0.46	-0.66	-0.43	-0.71	-0.19	Yes
N of Visits per Physician	-0.08	0.12	1.00	-0.30	-0.30	-0.19	-0.26	-0.18	-0.23	-0.15	-0.21	-0.40	-0.12	-0.31	Yes
Total Inpatient	0.75	-0.65	-0.30	1.00	0.96	0.76	0.98	0.81	0.87	0.62	0.92	0.22	0.78	0.14	Yes
N of State Hospital	0.76	-0.63	-0.30	0.96	1.00	0.74	0.98	0.81	0.88	0.62	0.93	0.21	0.80	0.12	Yes
N of University Hospital	0.48	-0.50	-0.19	0.76	0.74	1.00	0.82	0.53	0.60	0.73	0.64	0.11	0.53	0.01	Yes
N of Private Hospital	0.88	-0.68	-0.26	0.98	0.98	0.82	1.00	0.76	0.89	0.63	0.94	0.21	0.79	0.13	Yes
State Hospital Beds	0.72	-0.61	-0.18	0.81	0.81	0.53	0.76	1.00	0.78	0.60	0.81	0.33	0.78	0.07	Yes
Private Hospital Beds	0.85	-0.65	-0.23	0.87	0.88	0.60	0.89	0.78	1.00	0.63	0.93	0.30	0.88	0.08	Yes
University Hospital Beds	0.50	-0.46	-0.15	0.62	0.62	0.73	0.63	0.60	0.63	1.00	0.65	0.09	0.63	-0.01	Yes
Beds per 100,000 Population	0.79	-0.66	-0.21	0.92	0.93	0.64	0.94	0.81	0.93	0.65	1.00	0.25	0.89	0.07	Yes
State Hospital Satisfied (%)	0.44	-0.43	-0.40	0.22	0.21	0.11	0.21	0.33	0.30	0.09	0.25	1.00	0.20	0.00	Yes
University Hospital Satisfied (%)	0.79	-0.71	-0.12	0.78	0.80	0.53	0.79	0.78	0.88	0.63	0.89	0.20	1.00	0.23	Yes
Private Hospital Satisfied (%)	0.27	-0.19	-0.31	0.14	0.12	0.01	0.13	0.07	0.08	-0.01	0.07	0.00	0.23	1.00	No

As presented in Table 2, key findings and interpretations from the correlation analysis of Compound Annual Growth Rates (CAGR) for various healthcare system variables reveal distinct patterns of patient satisfaction across university, state, and private hospitals.

In university hospitals, a strong positive correlation (0.79) between the number of physicians and patient satisfaction indicates that increased physician availability is strongly linked to enhanced satisfaction. Conversely, the number of persons per physician shows a strong negative correlation (-0.71), suggesting that higher patient loads per physician lead to lower satisfaction. Additionally, a moderate positive correlation between total inpatient capacity (0.78) and state hospital beds (0.78) highlights that greater inpatient and bed capacities are associated with higher satisfaction. Notably, private hospital beds also exhibit a strong positive correlation (0.88) with satisfaction, and an even stronger positive correlation (0.89) with beds per 100,000 population underscores the significant impact of bed availability on satisfaction in university hospitals. For state hospitals, a moderate positive correlation (0.44) with the number of physicians and a weak positive correlation (0.33) with state hospital beds suggest a modest association with increased satisfaction. However, no significant correlations were found in private hospitals, indicating that variables like physician numbers and bed counts do not reliably predict patient satisfaction in these settings.

Table 3. Results of Simple Linear Regression Analysis on CAGRs of Variables

Dependent Variable (CAGR)	Independent Variable (CAGR)	Coefficient	Std. Error	t-Value	p-Value	Sig.
State Hospital Satisfied (%)	Number of Physicians	0.44	0.19	2.32	0.04	Yes
University Hospital Satisfied (%)	Number of Physicians	0.79	0.15	5.27	0.01	Yes
University Hospital Satisfied (%)	Number of Persons per Physician	-0.71	0.18	-3.94	0.01	Yes
University Hospital Satisfied (%)	Total Inpatient	0.78	0.20	3.90	0.01	Yes
University Hospital Satisfied (%)	State Hospital Beds	0.78	0.19	4.11	0.01	Yes
University Hospital Satisfied (%)	Private Hospital Beds	0.88	0.17	5.18	0.01	Yes
University Hospital Satisfied (%)	Beds per 100,000 Population	0.89	0.16	5.56	0.01	Yes
Private Hospital Satisfied (%)	None	None	None	None	None	No

Table 3 presents the results of simple linear regression analyses. In the analysis of state and university hospital satisfaction, the Compound Annual Growth Rate (CAGR) coefficients reveal significant trends. For state hospitals, a 1% annual increase in the number of physicians correlates with a 0.44% increase in satisfaction, a relationship that is statistically significant ($p < 0.05$). In university hospitals, various factors significantly impact satisfaction. A 1% annual increase in the number of physicians results in a 0.79% rise in satisfaction. Similarly, a 1% increase in the number of persons per physician leads to a 0.71% decrease in satisfaction. Moreover, increases in inpatient capacity, state hospital beds, and private hospital beds are associated with rises in satisfaction by 0.78%, 0.78%, and 0.88% respectively, each statistically significant ($p < 0.05$). Notably, a 1% increase in beds per 100,000 population results in a 0.89% rise in university hospital satisfaction, also statistically significant ($p < 0.05$). On the contrary, no significant correlations were found in private hospitals, suggesting that the variables examined do not strongly predict patient satisfaction. Therefore, private hospital managers may need to focus on other factors not covered in this study that could influence satisfaction levels.

Table 4. Results of Multiple Regression Analysis on CAGRs of Variables

Dependent Variable	Independent Variable	Coefficient	Std. Error	t-Value	p-Value	Sig.
State Hospital Satisfied (%)	CAGR - Number of Physicians	0.12	0.22	0.55	0.60	No
	CAGR - Number of Persons per Physician	-0.18	0.25	-0.72	0.50	No
	CAGR - Total Number of Visits per Physician	-0.10	0.23	-0.43	0.68	No
	CAGR - Total Inpatient	0.22	0.24	0.92	0.40	No
	CAGR - State	0.14	0.21	0.67	0.53	No
	CAGR - University	0.09	0.26	0.35	0.75	No
	CAGR - Private	0.11	0.20	0.55	0.60	No
	CAGR - State Hospital Beds	0.30	0.22	1.36	0.23	No
	CAGR - Private Hospital Beds	0.25	0.24	1.04	0.34	No
	CAGR - University Hospital Beds	0.05	0.27	0.18	0.87	No
	CAGR - Beds per 100,000 Population	0.15	0.23	0.65	0.54	No
University Hospital Satisfied (%)	CAGR - Number of Physicians	0.42	0.20	2.10	0.05	Yes
	CAGR - Number of Persons per Physician	-0.45	0.23	-1.96	0.07	No
	CAGR - Total Number of Visits per Physician	-0.12	0.21	-0.57	0.58	No
	CAGR - Total Inpatient	0.28	0.22	1.27	0.25	No
	CAGR - State	0.33	0.19	1.74	0.09	No
	CAGR - University	0.17	0.24	0.71	0.49	No
	CAGR - Private	0.38	0.18	2.11	0.05	Yes
	CAGR - State Hospital Beds	0.44	0.21	2.10	0.05	Yes
	CAGR - Private Hospital Beds	0.38	0.22	1.73	0.09	No
	CAGR - University Hospital Beds	0.19	0.25	0.76	0.46	No
	CAGR - Beds per 100,000 Population	0.45	0.22	2.05	0.05	Yes
Private Hospital Satisfied (%)	None	None	None	None	None	No

Table 4 shows the multiple regression analyses. The interpretation of significant results from a study on hospital satisfaction across university, state, and private hospitals demonstrates that certain factors distinctly influence satisfaction levels, particularly in university settings. For university hospitals, significant predictors include the number of physicians, where a 1% annual increase leads to a 0.42% increase in satisfaction, and the growth rate of private hospitals, which correlates with a 0.38% rise in satisfaction, both statistically significant ($p = 0.05$). Additionally, a 1% increase in state hospital beds results in a 0.44% increase in satisfaction, and a similar increase in beds per 100,000 population boosts satisfaction by 0.45%, indicating robust infrastructure impacts on satisfaction. In contrast, no significant predictors were identified for state and private hospital satisfaction in the multiple regression analysis, suggesting that combined variables do not strongly influence satisfaction levels in these hospital types. This highlights the complexity of factors that contribute to hospital satisfaction, particularly emphasizing the role of infrastructure in university hospitals.

The findings indicate that an increase in the number of physicians is significantly associated with higher patient satisfaction, particularly in university hospitals. This is supported by studies that found a positive correlation between the number of physicians per capita and patient satisfaction across various healthcare systems.[23-26]

To outline the hypotheses and analyses, the results support H1, H5, and H6 only for university hospitals but reject for other types of hospitals. Also, H2, H3, and H4 were rejected for all types of hospitals.

The positive correlation between the number of hospital beds per 100,000 population and patient satisfaction in

university hospitals aligns with findings from other studies. Research in Healthcare demonstrated that adequate hospital infrastructure, including a sufficient number of beds, is essential for maintaining high levels of patient satisfaction. This study underscored the importance of physical environment and infrastructure in shaping patient experiences, particularly during cross-regional medical treatment.[26, 27]

Hospital staff shortages relate significantly to patient satisfaction with physician and nursing care.[28] For instance, another study puts forward that patients exhibit a high degree of confidence and trust in nurses, yet their satisfaction with hospital care diminishes when they perceive a shortage of nursing staff. The findings indicate that strategies such as ensuring a sufficient number of Registered Nurses at the bedside and enhancing hospital clinical care environments are effective in increasing patient satisfaction with care.[29]

The relationship between occupational health and safety awareness of health workers and work efficiency suggests that improving these factors can indirectly enhance patient satisfaction by improving the quality of care provided. This is crucial as it relates to the overall performance and satisfaction of both healthcare workers and patients.[30]

On the other hand, some studies argue that socio-economic factors play a more critical role in patient satisfaction than the sheer number of healthcare resources. Research in BMC Health Services Research found that variables like GDP per capita and health expenditures significantly influence patient satisfaction, sometimes outweighing the direct impact of healthcare provision indicators such as the number of physicians and hospital beds.[24]

Subsequently, future research may focus on various parameters that could impact patient satisfaction levels, such as the motivation levels of healthcare professionals, depending on workload, facility conditions, etc.

CONCLUSION

Strategic planning is crucial in adapting to the rapidly changing healthcare environment. Effective strategic planning helps healthcare institutions become more efficient and responsive to patient needs, thus improving patient satisfaction.[31]

This study aimed to investigate the impact of various healthcare system variables on patient satisfaction in Turkish hospitals from 2009 to 2022. By analyzing the Compound Annual Growth Rate (CAGR) of independent variables such as the number of healthcare professionals, the number of hospital beds, and the number of persons per physician, we sought to identify the most significant predictors of patient satisfaction. The analysis utilized both correlation and regression techniques to understand these relationships.

University Hospitals

The number of physicians, the number of persons per physician, inpatient capacity, and hospital beds per 100,000 population were found to be significant predictors of patient satisfaction. Specifically, the number of physicians and the number of hospital beds (both state and private) showed strong positive correlations with satisfaction. These findings suggest that strategic management of healthcare resources is crucial for enhancing patient satisfaction in university hospitals.

State Hospitals

The study found that the number of physicians had a moderate positive impact on patient satisfaction. However, no significant predictors were identified in the multiple regression analysis, indicating that other factors not examined in this study might influence satisfaction in state hospitals. Strategic management efforts should focus on identifying and addressing these additional factors to improve patient satisfaction, such as the motivation levels of

healthcare professionals or the socio-economic factors of the patients.

Private Hospitals

The analysis did not identify any significant predictors of patient satisfaction in private hospitals. This suggests that patient satisfaction in private hospitals may be influenced by factors other than the healthcare system variables considered in this study, such as service quality, patient expectations, and personal experiences. Strategic management in private hospitals should therefore encompass other factors, including qualitative aspects of patient care.

Implications for Healthcare Policy and Management

The findings of this study have several important implications for strategic management in Türkiye:

Policymakers should prioritize increasing the number of healthcare professionals and hospital beds to improve patient satisfaction, especially in university hospitals. Strategic management of investments in healthcare infrastructure and human resources is likely to yield significant improvements in patient experiences. Specifically, the number of persons per physician negatively impacts satisfaction, strategies aimed at reducing the patient load per physician, such as making the positions in state and university hospitals more attractive for the physicians and optimizing patient flow in order to enhance satisfaction levels must be considered.

For private hospitals, insignificant values between healthcare system variables and patient satisfaction levels indicate the necessity of focusing on other strategic management approaches that include service quality, patient-centered care, and other qualitative factors. Private hospital administrators should consider these aspects to better understand and improve patient satisfaction rather than increasing the number of healthcare professionals or number of beds.

Recommendations for Future Research

While this study provides valuable insights, it also highlights the need for further research to fully understand the determinants of patient satisfaction in healthcare. Future studies should consider:

- Examining patient satisfaction at regional or local levels to capture variations within the country. This would help identify specific areas that require targeted strategic management interventions.
- Including qualitative variables such as patient expectations, service quality, and individual experiences to provide a more comprehensive understanding of satisfaction determinants.
- Conducting longitudinal studies to observe changes over time and identify long-term trends and impacts of strategic management policy changes on patient satisfaction.
- Expanding the scope of variables to include economic, social, and environmental factors that may influence patient satisfaction.

In conclusion, this study underscores the importance of strategic management of healthcare resources, particularly the number of physicians and hospital beds, in enhancing patient satisfaction in Turkish hospitals. While significant predictors were identified for university hospitals, further research is needed to uncover the factors influencing satisfaction in state and private hospitals. By addressing these aspects, policymakers and healthcare managers can better design and implement strategies to improve patient experiences and overall satisfaction within the healthcare system.

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