Determination of Criteria Affecting Service Quality in Health Sector by Fuzzy AHP Method

Sağlık Sektöründe Hizmet Kalitesini Etkileyen Kriterlerin Bulanık AHP Yöntemi ile Belirlenmesi

ABSTRACT

The health sector plays a fundamental role in improving the quality of life of individuals and maintaining their health. In this context, the quality of health services is of great importance. In this article, the Fuzzy Analytical Hierarchy Process (AHP) method was used to determine the criteria affecting the service quality in the health sector. Fuzzy AHP is accepted as an effective tool in complex and uncertain decision making processes. In the article, firstly, the basic criteria affecting the quality of health services were determined by examining the literature. Then, the Fuzzy AHP method was applied step by step to determine the priority ordering of these criteria. Fuzzy AHP helps us to obtain more realistic results by taking into account subjective evaluations and uncertainty. The aim of the study is to determine the criteria affecting the service quality in the health sector by using the Fuzzy AHP method, which is a multi-criteria decision-making method. The results of the study show that the Fuzzy AHP method is an effective tool in determining the priority rankings of the criteria affecting the service quality in the health sector. The results provide valuable information for health managers and decision makers to direct resources more effectively and focus on improving service quality. As a result of the literature review, four main and thirteen sub-criteria affecting the quality of health care were determined. As a result of the study, the "Adverse Events" sub-criterion belonging to the "Safety" main criterion among these criteria was determined as the most important criterion affecting the health service quality.

Keywords: Health Sector, Service Quality, Patient Satisfaction, Strategic Management, Fuzzy AHP

ÖZET

Sağlık sektörü, bireylerin yaşam kalitesini artırmak ve sağlıklarını sürdürmek amacıyla temel bir rol oynamaktadır. Bu bağlamda, sağlık hizmetlerinin kalitesi büyük önem taşmaktadır. Bu makalede, sağlık sektöründeki hizmet kalitesini etkileyen kriterlerin belirlenmesinde Bulanık Analitik Hiyerarşi Prosesi (AHP) yöntemi kullanılmıştır. Bulanık AHP, karmaşık ve belirsiz karar verme süreçlerinde etkili bir araç olarak kabul edilmektedir.Makalede ilk olarak, sağlık hizmetlerinin kalitesini etkileyen temel kriterler literatür incelenerek belirlenmiştir. Ardından, bu kriterlerin öncelik sıralamalarını belirlemek için Bulanık AHP yöntemi adım adım uygulanmıştır. Bulanık AHP, subjektif değerlendirmeleri ve belirsizliği hesaba katarak daha gerçekçi sonuçlar elde etmemize yardımcı olmaktadır. Çalışmanın amacı çok kriterli karar verme yöntemi olan Bulanık AHP yöntemini kullanarak sağlık sektöründeki hizmet kalitesini etkileyen kriterleri tespit etmektir.Çalışmanın sonuçları, sağlık sektöründeki hizmet kalitesini etkileyen kriterlerin öncelik sıralamalarını belirlemede Bulanık AHP yönteminin etkili bir araç olduğunu göstermektedir. Elde edilen sonuçlar, sağlık yöneticilerine ve karar vericilere, kaynakları daha etkin bir şekilde yönlendirmeleri ve hizmet kalitesini artırmaya odaklanmaları için değerli bilgiler sunmaktadır. Alan yazın taraması sonucunda sağlık hizmet kalitesini etkileyen dört ana ve on üç alt kriter tespit edilmiştir. Çalışmanın sonucunda bu kriterlerden "Güvenlik" ana kriterine ait "Olumsuz Olaylar" alt kriteri sağlık hizmet kalitesini etkileyen en önemli kriter olarak tespit edilmiştir.

Anahtar Kelimeler: Sağlık Sektörü, Hizmet Kalitesi, Hasta Memnuniyeti, Stratejik Yönetim, Bulanık AHP

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INTRODUCTION

Health care quality stands out as one of the main goals of modern health systems and is closely followed by various health care providers, policy makers and health professionals in order to increase the quality of life of individuals, improve health outcomes and protect public health (Ünal, 2014). Health care quality is a concept that reflects the success and effectiveness of a health system or health care provider that meets the health needs of individuals and

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aims to provide the best medical care. This quality includes keeping patients safe, minimizing medical errors, patient satisfaction, minimizing the effects of illness, meeting patients' needs and using medical resources effectively (Küçükaksu vd., 2004). Today is a period in which health services focus not only on the treatment of diseases, but also on broader goals such as prevention of diseases, protection of health and improving quality of life (Şanlıöz, Sağbaş and Sürücü, 2022). Therefore, the quality of health care should be considered as a combination of not only medical activities, but also a wide variety of factors such as patient satisfaction, accessibility, safety, ethical values, communication and management processes. It is a concept that includes ethical norms, accessibility and management processes (Sürücü, Yıldız and Sağbaş, 2023). This multi-faceted approach supports health care providers and health policy makers to meet the health needs of the society in the best way and to ensure that health services are delivered in an effective, safe and people-centered manner (Kelly, 2007).However, the poor quality of health services affects all patients and increases health costs by wasting the resources to be used by the hospital to treat them (Varkey, 2010).

The determination of the factors that determine the quality of health care and the systematic evaluation of these factors enable health care providers, managers and policy makers to base their decisions on a more solid scientific basis. Understanding the factors affecting service quality guides the determination of strategic developments and improvements in service delivery. This process is of great importance in terms of enabling the achievement of goals such as increasing patient safety and quality of care, responding better to patients' needs, and making the health system more sustainable. Factors affecting the quality of health care are quite diverse and complex (Şen, 2021). In the 2019-2023 development plan published by the Ministry of Development, the issue of "revising the quality standards in health and determining the mandatory minimum standards for health service delivery" has been proposed for the solution of the problems in the field of health. A number of factors such as clinical outcomes, patient satisfaction, access to healthcare services, safety, cost-effectiveness, resource utilization, geographical factors play a role in determining healthcare quality. (Kalkınma Bakanlığı, 2018). The balance and prioritization between these factors is a critical step for effective planning and management of healthcare delivery. However, evaluating and prioritizing these multifaceted and complex factors often proves to be a challenging task. Integrating these factors affecting the quality of health care into decision-making processes is an important requirement for health policy makers, managers and health care providers. This is where multi-criteria decision-making methods come into play (Aydın, 2021). Multi-criteria decision-making methods stand out as powerful tools used in evaluating complex and multidimensional data and balancing different factors in harmony with each other. These methods put subjective evaluations in an objective framework and offer decision makers the opportunity to better understand and evaluate the importance and impact of different factors (Ertuğrul ve Karakaşoğlu, 2010).

Determining and prioritizing the factors affecting the quality of health care with multi-criteria decision-making methods helps to make health care delivery more effective, efficient and patient-oriented. These methods increase the sustainability of health systems and positively affect the health experiences of individuals. This work encourages more informed and focused decisions to allocate resources effectively, meet patients' needs, and ensure more equitable and equitable delivery of health care, while developing strategies to improve health care quality.

LITERATURE REVIEW

Hersh et al. (2001) aimed to evaluate the effectiveness of telemedicine interventions on health outcomes in two application classes, home-based and office/hospital-based. As a result, it was determined that the strongest evidence for the effectiveness of telemedicine in clinical outcomes did not come from home telemedicine in the fields of chronic disease management, hypertension and AIDS. Kairy et al. (2009) aimed to determine the clinical outcomes, clinical process, utilization of health services and costs associated with tele-rehabilitation for individuals with physical disabilities. As a result of their studies, it was stated that clinical outcomes improved after a tele-rehabilitation intervention. Han et al. (2013), on the other hand, aimed to evaluate the quality of life in home care patients according to the change in health status results between the start of care and discharge or the 60th day (whichever comes first).

Ayimbillah Atinga et al. (2011) studies aimed to examine how communication, provider courtesy, support/care, facility environment, and waiting time significantly predicted patients' satisfaction with healthcare quality at two hospitals in northern Ghana. The results revealed that support/care, facility environment, and waiting time in the five-factor model determine patients' satisfaction with healthcare quality. Ahenkan and Aduo-Adjei (2017) examined patient satisfaction with the quality of healthcare services in Ghana by comparing healthcare services at the University Hospital of Ghana and Cape Coast University Hospital in their study. Findings in their study showed that empathy, communication, culture, material values and priority were important predictors of patient satisfaction.

Brown et al. (2000) demonstrated in their study that the combination of evidence-based medicine, patient-based choices using benefit analysis, and econometric modeling provides a model for assessing the incremental cost-effectiveness of healthcare interventions, and that thanks to this methodology, the cost-effectiveness of nearly all healthcare interventions can be compared and that can improve the quality of healthcare and can improve the quality of healthcare. They stated that an information system that can reduce costs is provided at the same time. In addition, he stated in the study that such an information system could save more than $90 billion annually from the annual health bill of $1.3 trillion in the United States.

In their study, Hellings et al. (2007) aimed to measure patient safety culture in five Belgian general hospitals. The results of the study indicate that important aspects of patient safety culture in these hospitals need to be improved. Bodur and Filiz (2009) evaluated the patient safety culture in primary health care units in their study. As a result, they evaluated that it would be appropriate to develop a patient safety culture as a priority among health center managers and to encourage health personnel to report errors without fear of criminal action.

Pittet (2005) states that healthcare-associated infection continues to be an important issue for patient safety, complicating a significant portion of patient care services, increasing the burden of resource use and contributing to unexpected deaths. He states that in order to be successful in infection control, it is necessary to recognize and explain healthcare-associated infections and to reduce infection rates.

Classen (2003) stated that adverse drug events occur in more than 6.5% to 20% of hospitalized patients and that most of these adverse drug events are avoidable. Classen and Metzger (2013) review approaches to measuring drug safety in terms of both harm and error and propose a strategy that combines both approaches in the electronic age. As a result of the study, it is recommended that electronic measurement for drug safety be used at the highest possible level as it is a much more cost-effective and comprehensive view of both problems and progress.

In their study, Govind et al. (2008) focus on the allocation of existing hospital resources to different types of diseases in order to better serve the needs of patients. With their proposed method, they examine the hospital network in a geographical region and determine the rate of resources that each hospital should allocate to different disease classes. As a result of the study, they found that there is a significant shortage of available bed days for socio-economic status-related diseases, especially in the downtown-Los Angeles area.

Petersen et al. (2006) aimed to systematically review studies evaluating the impact of explicit financial incentives for improved performance on measures of health care quality. The study concluded that continuous monitoring of incentive programs is critical to determine the effectiveness of financial incentives and their potential undesirable effects on quality of care.

DosAnjosLuis and Cabral (2016) stated the purpose of their study as measuring the geographic accessibility of the population to existing Health Centers and estimating the number of people served by the Mozambique health network. As a result of the study, critical areas where Health Centers are lacking were determined in Mozambique, when walking and driving time were evaluated by distance. Most Mozambicans were found to be in underserved areas when they had to go to health centers by walking, not by car. In similar studies on this subject, Roväli and Kiivet (2006) stated that a person's distance to health access should be less than 30 minutes, while Kara and Egresi (2013) evaluated that it is appropriate to be less than 45 minutes.

Jones et al. (2016) report in their study that for MS patients in the USA, the use of health resources and health care costs increase with the progression of disability, and as disability worsens, patients also exhibit a decrease in health-related quality of life and work productivity. In a study of 1510 patients receiving MS treatment in the USA, it was found that adherence to a disease-modifying drug was associated with significantly lower use of healthcare resources (Yermakov et al., 2015).

Michael et al. (2013) examined the effect of waiting times on patient satisfaction in their study. In the study, they examined the waiting times in two stages as the time spent in the waiting room and the time spent in the examination room, and they examined the reduction of waiting times.

Lee et al. (2015) in their study, with the model they presented for the workflow in the emergency services, they helped to reduce the length of stay at GradyMemorial Hospital in Atlanta, Georgia by roughly 33 percent, repurposing the hospital's existing resources and reducing the rate of re-admissions to the emergency department by 28 percent. They stated that they established a clinical decision unit that resulted in a decrease in They stated that with the application of the model, more than 32 percent of non-urgent care cases in the emergency department disappeared and the hospital financial situation improved. However, the duration of stay in the emergency room and reduced to seven hours was explained as the advantage offered by this model. Other advantages that are stated

are that with the model, the efficiency of the emergency room and trauma increased by more than 16 percent and the number of patients who left without being seen decreased by more than 30 percent.

METHOD

Fuzzy AHP method was used in this study. First, the criteria affecting the quality of health care services were determined as a result of the literature review, and these criteria were classified under the main criteria according to their similar aspects. Later, these criteria were compared with the evaluation of the experts. A form was sent to the experts for comparison. The following scale used in the study was used and scored according to the following criteria:

Table 1: Scoring Criteria

Language	Triangular Fuzzy Scale	Reciprocal Scale
Equal	1, 1, 1	1, 1, 1
A Little More Important	2, 3, 4	1/4, 1/3, 1/2
Strongly Importary	4, 5, 6	1/6, 1/5, 1/4
Very Strongly Important	6, 7, 8	1/8, 1/7, 1/6
Totally Important	8, 9, 9	1/9, 1/9, 1/8

Source: Produced by the authors

Fuzzy matrices were created. In the fuzzy AHP method, the matrices must be below 10 percent of the consistency tests (Saaty, 1980). In the matrices exceeding 10 percent, the criteria increasing the inconsistency were determined and excluded from the study. The weights of the matrices were determined by the weights of the criteria. The weights of the sub-criteria were multiplied with the weights of the main criteria they belonged to, thus the final weights were determined. The final weights were ordered from largest to smallest, and the prioritization process was carried out. The following procedure was applied for weight calculation (Ramík & Korviny, 2010):

$$w_k^L = C_{\min} \cdot \frac{\left(\prod_{j=1}^n a_{kj}^L\right)^{1/n}}{\sum_{i=1}^n \left(\prod_{j=1}^n a_{kj}^M\right)^{1/n}}, \text{ where } C_{\min} = \min_{i=1,\ldots,n}\left\{\frac{\left(\prod_{j=1}^n a_{ij}^M\right)^{1/n}}{\left(\prod_{j=1}^n a_{ij}^L\right)^{1/n}}\right\}, \qquad (1)$$

$$w_k^M = \frac{\left(\prod_{j=1}^n a_{kj}^M\right)^{1/n}}{\sum_{i=1}^n \left(\prod_{j=1}^n a_{ij}^M\right)^{1/n}}, (2)$$

$$w_k^U = C_{\max} \cdot \frac{\left(\prod_{j=1}^n a_{kj}^U\right)^{1/n}}{\sum_{i=1}^n \left(\prod_{j=1}^n a_{kj}^M\right)^{1/n}}, \text{ where } C_{\max} = \max_{i=1,\ldots,n}\left\{\frac{\left(\prod_{j=1}^n a_{ij}^M\right)^{1/n}}{\left(\prod_{j=1}^n a_{ij}^U\right)^{1/n}}\right\}, \qquad (3)$$

RESULTS

Determination of Criteria

As a result of the literature review, four main criteria and 13 sub-criteria affecting the quality of health care were determined (Table 2). The main criteria were determined by categorizing the sub-criteria. As a result of this process, it was determined that the main criteria were effectiveness, safety, accessibility and efficiency.

Table2: Criteria Affecting Health Care Quality

Main Criteria	Sub-Criteria	Authors
(A1) Effectiveness	(A1.1) Clinical Results	Hersh et al. (2001) Kairy et al. (2009), Han et al. (2013)
	(A1.2) Patient Satisfaction	AyimbillahAtinga vd. (2011), Ahenkan ve Aduo-Adjei, (2017)
	(A1.3) Cost Effectiveness	Brownet al. (2000)
(A2) Security	(A2.1) Adverse Events	Brady et al. (2009)
	(A2.2) Patient Safety Culture	Hellings et al. (2007), Bodur and Filiz (2009)
	(A2.3) Infection Control	Pittet (2005)
	(A2.4) Drug Safety	Classen (2003), Classen and Metzger (2013)
(A3) Accessibility	(A3.1) Timely Access	Govind et al. (2008)
	(A3.2) Financial Accessibility	Petersen et al. (2006)
	(A3.3) Geographical Accessibility	DosAnjosLuis and Cabral (2016), Rooväli andKiivet (2006), Kara and Egresi (2013)
(A4) Productivity	(A4.1) Resource Usage	Yermakov et al. (2015) Jones et al. (2016)
	(A4.2) Waiting Times	Michael et al. (2013)
	(A4.3) Workflow Optimization	Lee et al. (2015)

Source: Produced by the authors

Effectiveness

Clinical Outcomes: It can be explained as measurable improvements in patients' health conditions, such as reduced mortality, improved symptom management, and disease control. In other words, clinical outcomes refer to significant improvements in patients' health conditions and reaching their health goals. For example, measurable improvements such as reduced mortality, better management of symptoms and increased disease control reflect the real impact of healthcare. Good clinical outcomes increase patients' quality of life, reduce long-term health complications, and improve public health (Han et al., 2013).

Patient Satisfaction: Patients' feedback and perceptions about their overall experience, their communication with healthcare providers, and their satisfaction with the treatment received. Patient satisfaction is related to the delivery of health services in line with patient experiences and expectations. Patient satisfaction assessments reflect healthcare providers' communication abilities, patient orientation, and understanding of patients' emotional and psychological needs. Good communication and patient focus can increase patients' adherence to treatment, strengthen trust, and positively affect treatment outcomes (Ahenkan & Aduo-Adjei, 2017).

Cost effectiveness: It is the efficient use of resources to achieve desired health care outcomes, taking into account the balance between the benefits derived from health interventions and the costs incurred. The cost-effectiveness of health services helps to manage resources effectively by making the best use of limited health resources. It is critical to the sustainability and long-term success of health systems. Cost-effectiveness can reduce unnecessary financial burdens, increase access to health services, and support a more equitable delivery of health services to different segments of society (Brown et al., 2000).

Security

Adverse Events: Occurrence of undesirable harm or complications resulting from medical interventions or health system malfunctions. That is, conditions that cause harm or complications to patients as a result of medical interventions or health system malfunctions. Such events can endanger the health of patients and even lead to fatal consequences. Monitoring, analysis and prevention of adverse events play a critical role in improving the safety and quality of healthcare. By learning from these events, continuous improvement can be achieved and the repetition of similar mistakes can be prevented (Brady et al., 2009).

Patient Safety Culture: It is the application of safety protocols, error reporting systems and a culture of continuous improvement to ensure patient safety. Patient safety culture means that healthcare providers and healthcare institutions adopt an approach that prioritizes safety. Safety protocols, error reporting systems, and a culture of continuous improvement help prevent adverse events and ensure the safety of healthcare services. Patient safety culture increases the education and awareness of healthcare personnel, minimizes errors and strengthens patient trust (Hellings et al., 2007).

Infection Control: The process of implementing measures and protocols to prevent and control healthcare-associated infections. Healthcare-associated infections can negatively affect the healing process of patients and even lead to fatal outcomes. Infection control measures and protocols are aimed at reducing the risk of infection of patients and healthcare workers in hospitals and other healthcare facilities. These measures protect the health of patients and staff while increasing the safety and quality of health services (Pittet, 2005).

Medication Safety: Systems and practices in place to minimize medication errors and ensure the safe and appropriate use of medications. Medication errors and misuse of drugs can cause serious health problems. Drug safety includes correct prescribing, dosage adjustment and correct use of drugs by patients. By minimizing medication errors, it is ensured that patients are treated safely and effectively (Classen and Metzger, 2013).

Accessibility

Timely Access: Expressed as the speed with which individuals can receive necessary health services, including appointment availability and waiting times. Timely access enables individuals to access health services quickly when they need it. This includes appointment availability, waiting times and emergency services. Timely access can reduce complications and long-term health problems by enabling patients to start treatment on time and catch health problems at earlier stages (Govind et al., 2008).

Financial Accessibility: The affordability of health services and insurance coverage ensures that individuals can access care without facing significant financial burdens. The affordability of health services and insurance coverage ensures that individuals can receive the necessary care without financial difficulties. High financial burdens can cause individuals to avoid or delay health services, which can lead to worsening health problems. Financial accessibility improves the general health of society by reducing inequalities (Petersen et al., 2006).

Geographical Accessibility: The proximity of health facilities to population centers provides individuals with reasonable access to health services. The proximity of health facilities to population centers facilitates individuals' access to health services. For individuals living in remote areas or with limited means of transportation, geographic accessibility is an important factor in accessing health services. Equal geographic access supports the fair delivery of health services and the reduction of health inequalities in society (DosAnjosLuis and Cabral, 2016).

Productivity

Resource Utilization: The effective allocation of health resources, including medical equipment, facilities, and staff, to ensure that care is delivered efficiently. Allocating health resources effectively and efficiently ensures the best use of medical equipment, facilities and personnel. This creates more patient care and treatment opportunities, while reducing waste. Effective resource use increases the quality while supporting the sustainability of health services (Jones et al., 2016).

Waiting Times: The amount of time people have to wait for various healthcare services such as appointments, diagnostic tests, and surgical procedures. Waiting times refer to the time people spend to receive health care. Long waiting times can delay patients' access to treatment, adversely affect treatment outcomes, and reduce patient satisfaction. Short waits improve patients' health outcomes by increasing access to rapid diagnosis and treatment (Michael et al., 2013).

Workflow Optimization: The modernization and optimization of healthcare processes and workflows to increase efficiency, reduce redundancies, and improve patient flow. The modernization and optimization of healthcare processes makes the workflow more efficient. This reduces unnecessary delays, minimizes errors and enables better organization of healthcare services. Optimization of the workflow enables patients to receive care more quickly and effectively (Lee et al., 2015).

Creating Fuzzy Matrices of Criteria

After the criteria were determined, the experts were asked to compare the criteria affecting the quality of health services and to determine the level of importance. The following fuzzy matrices were obtained by taking the geometric mean of the experts' evaluations.

Table 3: Fuzzy Matrix of Main Criteria

	A1	A2	A3	A4
A1	1 1 1	0,537,0,669,0,841	0,707,1,000,1,414	2,000,2,590,3,130
A2	1,189,1,495,1,861	1 1 1	1,189,1,732,2,378	2,000,2,590,3,130
A3	0,707,1,000,1,414	0,420,0,577,0,841	1 1 1	2,000,2,590,3,130
A4	0,319,0,386,0,500	0,319,0,386,0,500	0,319,0,386,0,500	1 1 1
Consistency Test: 0,011				

Source: Produced by the authors

Table 2 shows the fuzzy matrix of the main criteria. According to the table, it was determined that the most important criterion in health service quality is safety (0.37), the second most important criterion is effectiveness criterion (0.264). Although effectiveness, accessibility and efficiency are the basic dimensions of health service quality, safety serves as the basis on which other criteria can be built. Without a safe healthcare environment, the

effectiveness of treatments, accessibility to services and efficiency of processes can be compromised, hindering overall quality of care.
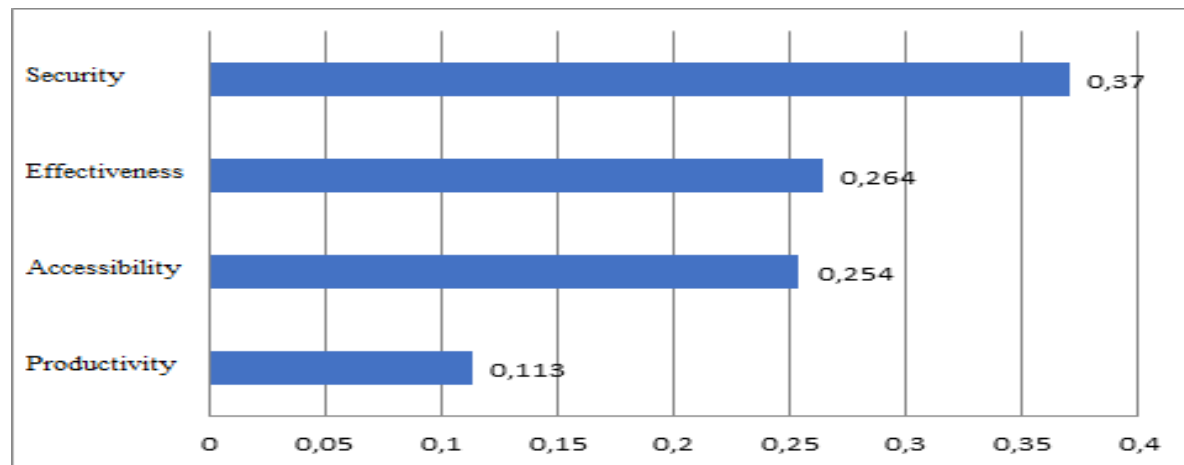

Figure 1: Ranking of Main Criteria
Source: Produced by the authors

Table 3 shows the fuzzy matrix of the effectiveness criterion. According to the matrix, the order of the criteria is A1.1>A1.2>A1.3.

Table 4: Fuzzy Matrix Of Efficiency Criteria

	A1.1	A1.2	A1.3
A1.1	1 1 1	1,682,2,280,2,828	3,364,4,401,5,422
A1.2	0,354,0,439,0,376	1 1 1	1,682,2,280,2,828
A1.3	0,184,0,227,0,297	0,354,0,439,0,376	1 1 1
ConsistencyTest: 0,003			

Source: Produced by the authors

According to the table, the most important criterion in the effectiveness criterion is clinical results (0.596), and the second most important criterion is the patient satisfaction criterion (0.276). makes it successful.
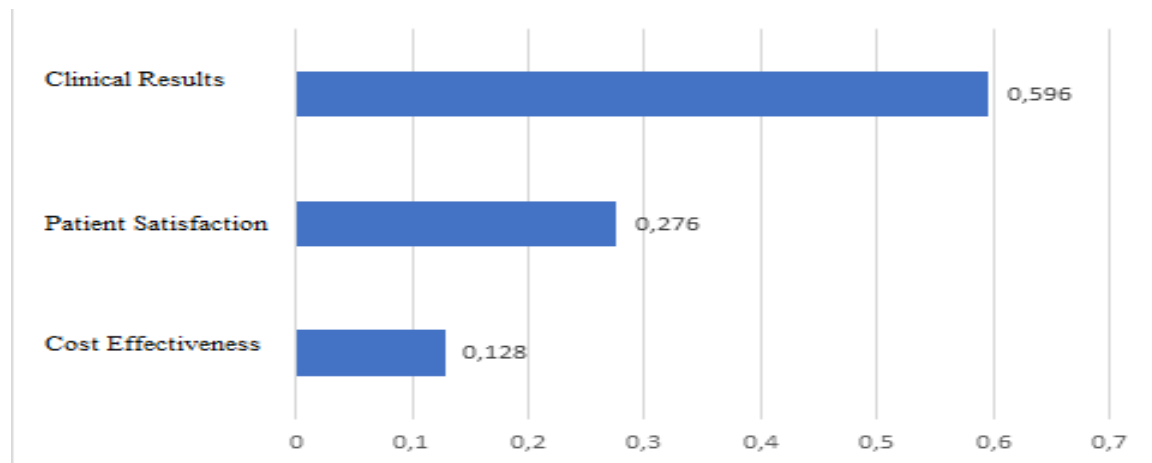

Figure 2: Ranking of Effectiveness Criteria
Source: Produced by the authors

Table 4 Shows the fuzzy matrix of the safety criterion. According to the matrix, the order of the criteria is A2.1>A2.2>A2.3>A2.4.

Table 5: Fuzzy Matrix of Security Criteria

	A2.1	A2.2	A2.3	A2.4
A2.1	1 1 1	1,414,1,968,2,632	2,000,2,590,3,130	2,378,3,409,4,427
A2.2	0,380,0,508,0,707	1 1 1	2,000,2,590,3,130	2,000,3,000,4,000
A2.3	0,319,0,386,0,500	0,319,0,386,0,500	1 1 1	1,414,1,732,2,000
A2.4	0,226,0,293,0,420	0,250,0,333,0,500	0,500,0,577,0,707	1 1 1
Consistency Test:0,024				

According to the table, it has been determined that the most important criterion in the safety criteria is adverse events (0.439), and the second most important criterion is the patient safety criterion (0.303). By giving priority to the reduction of negative events, health institutions create safer environments and improve patient safety culture.
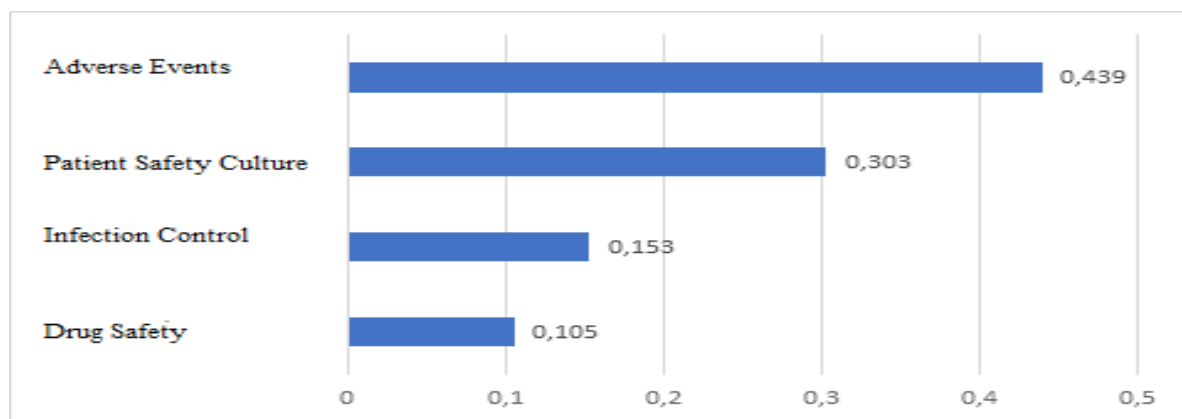
Figure 3: Ranking of Security Criteria
Source: Produced by the authors

Table 3. shows the fuzzy matrix of the accessibility criterion. According to the matrix, the order of the criteria is A3.1>A3.2>A3.3.

Table 6: Fuzzy Matrix of Accessibility Criteria

	A3.1	A3.2	A3.3
A3.1	1 1 1	2,378 3,409 4,427	2,828 3,344 3,834
A3.2	0,226 0,293 0,420	1 1 1	1,000 1,316 1,682
A3.3	0,261 0,299 0,354	0,354 0,439 0,595	1 1 1
Consistency Test: 0,009			

Source: Produced by the authors

According to the table, it has been determined that the most important criterion in the accessibility criterion is timely access (0.627), and the second most important criterion is the financial accessibility criterion (0.276). The criterion of timely access directly impacts health outcomes, reduces inequalities, increases patient satisfaction, and supports efficient resource allocation. Healthcare organizations improve the overall quality and effectiveness of care delivery by prioritizing timely access to healthcare.
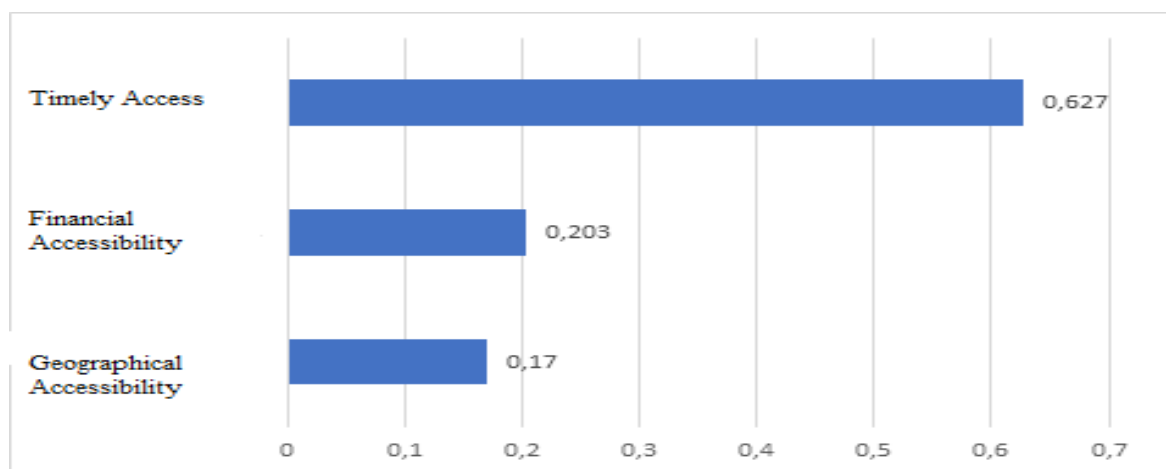

Figure 4: Sorting Accessibility Criteria
Source: Produced by the authors

Table 3. shows the fuzzy matrix of the efficiency criterion. According to the matrix, the order of the criteria is A4.1>A4.3>A4.2.

Table 7: Fuzzy Matrix of Efficiency Criteria

	A4.1	A4.2	A4.3
A4.1	1 1 1	3,130 3,637 4,120	1,682 2,280 2,828
A4.2	0,243 0,275 0,319	1 1 1	0,707 1,000 1,414
A4.3	0,354 0,439 0,595	0,420 0,577 0,841	1 1 1
Consistency Test: 0,023			

Source: Produced by the authors

It has been determined that the most important criterion in the task-activity criterion for the table is resource utilization (0.589), and the second most important criterion is the workflow optimization criterion (0.221). Resource utilization encompasses efficient delivery of care, fair access, cost containment, workflow optimization

and long-term sustainability. Healthcare organizations that use resources effectively increase overall healthcare quality and patient satisfaction by providing timely, accessible and cost-effective care.
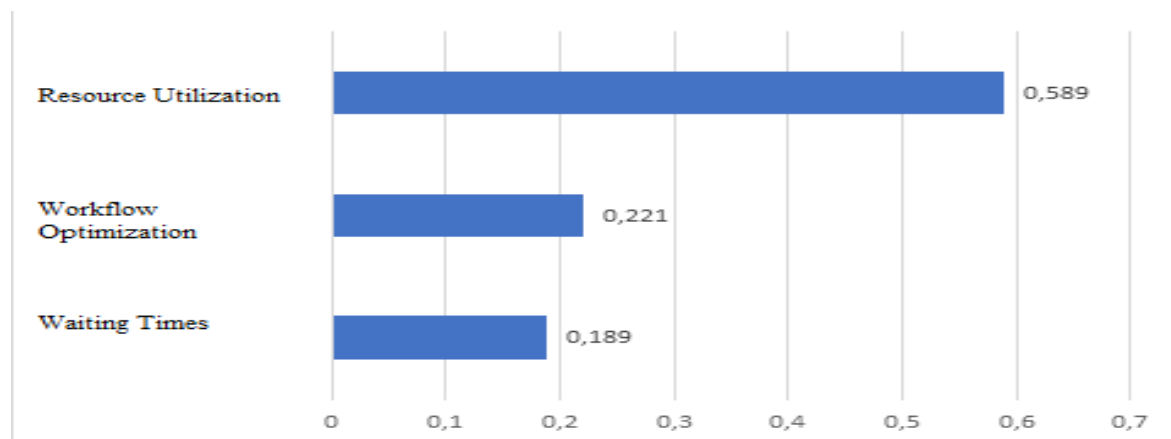

Figure 5: Ranking of Efficiency Criteria
Source: Produced by the authors

Ranking the Criteria

The final weights of the sub-criteria were determined by multiplying the weights of the main criteria with the weights of the sub-criteria. Thus, which criteria are listed in terms of health service quality. Order of criteria A4.1<A4.2<A1.3<A2.4<A3.3<A3.2<A2.3<A4.3<A1.2< A2.2<A1.1<A3.1< A2.1.

Table 8: Final Weights of Criteria

Weights of Main Criteria	Sub-criteria	Ratio Weight	Consistency Test	Final Weight
0,264	A1.1	0,596	0,003	0,157
	A1.2	0,276		0,073
	A1.3	0,128		0,034
0,37	A2.1	0,439	0,024	0,162
	A2.2	0,303		0,112
	A2.3	0,153		0,057
	A2.4	0,105		0,039
0,254	A3.1	0,627	0,009	0,159
	A3.2	0,203		0,052
	A3.3	0,17		0,043
0,113	A4.1	0,189	0,023	0,021
	A4.2	0,221		0,025
	A4.3	0,589		0,067

Source: Produced by the authors

It has been determined that the most important criterion affecting the quality of health services is the criterion of adverse events (16.2%). Adverse events are events that result in unintended harm or injury to patients. Prioritizing the prevention and reduction of adverse events is very important to ensure patient safety. The occurrence of adverse events can have significant adverse effects on patients' well-being and overall health care quality. Adverse events are often caused by errors, system malfunctions, or deficiencies in patient safety practices. By monitoring and addressing adverse events, healthcare providers can identify areas for improvement and implement strategies to prevent future occurrences. Focusing on adverse events helps reduce the occurrence of preventable harm, improving patient safety and the overall quality of healthcare. Patient trust and confidence in the healthcare system is directly affected by the system's ability to ensure patient safety. Prioritizing the monitoring and prevention of adverse events demonstrates a commitment to transparency, accountability and patient-centered care. Patients are more likely to trust and trust healthcare organizations that prioritize patient safety and take proactive measures to prevent adverse events. Analyzing adverse events and implementing corrective actions contributes to a culture of continuous improvement in healthcare organizations. By identifying the root causes of adverse events, healthcare providers can learn from mistakes, implement changes, and improve patient safety practices. This commitment to learning and improvement promotes a safer healthcare environment and improves the overall quality of care.
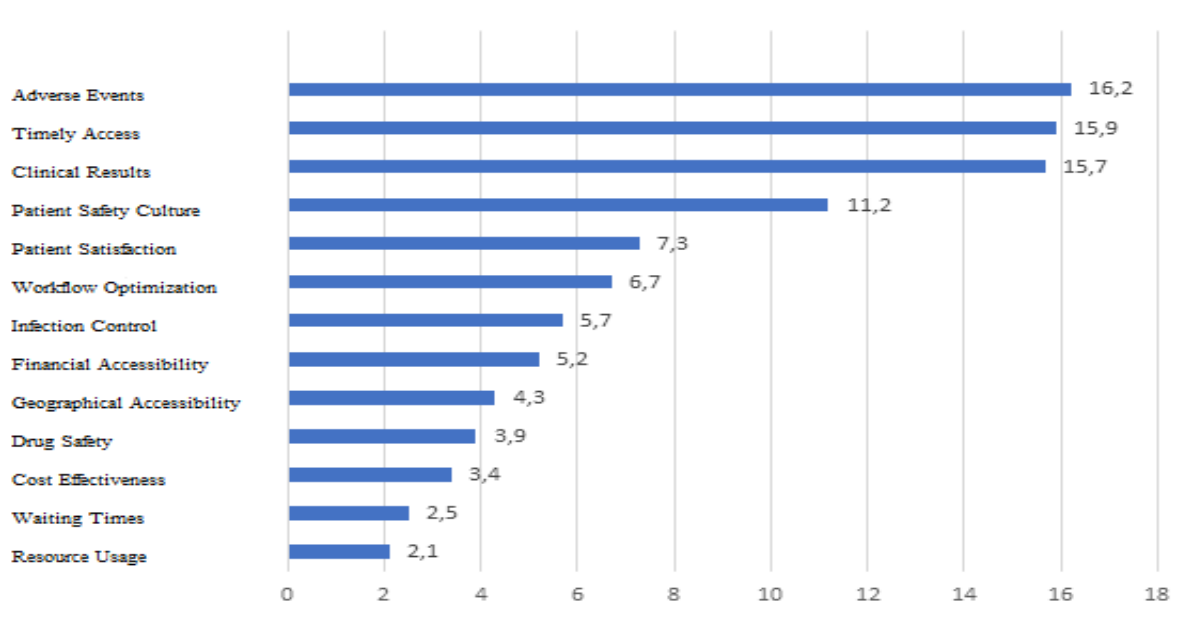
Figure 6: Ranking of Influencing Criteria in Healthcare Quality
Source: Produced by the authors

CONCLUSION

The results of this study constitute an important step in determining and evaluating the service quality in the health sector. In the study, the process of determining the criteria affecting the quality of health care is discussed in a more detailed and comprehensive way by using the Fuzzy Analytical Hierarchy Process (Fuzzy AHP). The advantages of this method are the ability to obtain more realistic results in complex and uncertain decision-making processes and the opportunity to prioritize different factors. The criteria supported by the literature review and expert opinions clearly show that the quality of health care is multidimensional and shaped by multiple factors. As a result of this study, the "Adverse Events" sub-criterion of the "Safety" main criterion was determined as the most important criterion affecting the quality of health care services. There could be several reasons for this. First of all, "Adverse Events" refers to patients being harmed during the treatment process or experiencing undesirable consequences as a result of medical errors. Patient safety is a fundamental element of healthcare quality, and adverse events therefore demonstrate that healthcare is effectively managed and patients are protected. Secondly, minimizing adverse events and managing them effectively increases patient satisfaction. When patients have negative experiences that cause them to be dissatisfied with health services, they may evaluate the quality of this service as low. Therefore, reducing the effects of adverse events will increase patient satisfaction and confidence. The data obtained from these events can help to understand the causes of errors and to prevent the repetition of similar errors. This process is important to increase the quality of health services and to keep patient safety at the highest level. Third, data from adverse events helps to understand the causes of errors and to prevent the recurrence of similar errors. This process is important to increase the quality of health services and to keep patient safety at the highest level. Fourth, adverse events affect patient satisfaction. Having a negative experience with a patient can damage the relationship of trust with healthcare providers. Reducing or preventing adverse events can increase patient satisfaction. Fifth, adverse events can affect the social perception of health institutions or health professionals. The media and the public are sensitive to such events, and reporting a negative event can damage the reputation of institutions. An event that occurs in a simpler way can be perceived as a great decrease in the quality of health services due to this negative reputation. Sixth and last, adverse events can reduce the effectiveness and efficiency of health services. Resources can be wasted due to medical errors or unnecessary procedures, which poses a major problem for the sustainability of the health system and the importance of resource management.

The health sector places a special emphasis on quality management due to its dynamic structure and constantly evolving demands. In this context, the Fuzzy AHP method can help healthcare providers and managers take steps to improve service quality by using their resources in the most effective way. The results obtained will be able to guide health policy makers in the strategic management of health services. Therefore, all stakeholders in the healthcare industry have the potential to base their efforts on assessing and improving healthcare quality on a more scientific and data-driven basis by adopting the analytical approach provided by the Fuzzy AHP method. Future research may include analysis of different healthcare institutions, different regions, and different patient groups. . In this way, the generalization and applicability of the Fuzzy AHP method can be evaluated in a broader perspective. There may also be a need to add new criteria or update existing criteria in order to adapt to technological and

societal changes in the health sector. Such a process could be a valuable step towards further improving the quality of healthcare and responding to the future needs of the industry. The fuzzy AHP method can be used as a guide in the field of health care quality. While addressing the complexity and multidimensional nature of healthcare, this method offers the opportunity to more effectively manage the challenges facing the healthcare industry. Health care providers, policy makers and researchers should continuously strive to improve the quality of health care by adopting the analytical approach provided by this method.

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