

Analysis of incorrect referrals to the cardiovascular surgery outpatient clinic

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ABSTRACT

Objectives: This study aimed to determine the rate of incorrect referrals to the cardiovascular surgery outpatient clinic.

Patients and methods: This study retrospectively reviewed the electronic patient records of patients admitted to a cardiovascular surgery outpatient clinic between July 1, 2021, and December 1, 2022. Patients were categorized into the incorrect referral group and the appropriate admission group. Patients who should have initially presented to the cardiology outpatient clinic for symptoms such as palpitations, exertional chest pain, echocardiography control, and routine cardiac check-ups were classified as incorrect referrals. Age, sex, and Central Physician Appointment System usage were the other variables recorded in the study.

Results: Of the 2,675 patients (1,540 females, 1,135 males; mean age: 53.3±18.0 years; range, 5 to 97 years) evaluated in the study, 316 (11.8%) were categorized into the incorrect referral group. The rate of incorrect referral was 18.63% for patients who applied through the Central Physician Appointment System, whereas it was 4.43% for those who applied without an appointment. There was a significant relationship between the Central Physician Appointment System use and incorrect referral ($p<0.001$). Multivariate logistic regression model showed that both age and the use of the Central Physician Appointment System independently predicted inappropriate visits ($p<0.001$).

Conclusion: The Central Physician Appointment System alone is inadequate to prevent inappropriate admissions. Enhancing the role of artificial intelligence in the appointment system, improving health literacy, and simplifying branch names are potential changes that can be implemented to prevent incorrect referrals.

Keywords: Cardiology, cardiovascular surgery, central physician appointment system, outpatient clinic, referral and consultation.

Outpatient clinic examinations constitute an important branch of healthcare services. It is crucial for patients to apply to the appropriate outpatient clinics based on their complaints and receive healthcare promptly. Over the years, the growing population, challenges in implementing the healthcare level system, and a shortage of physicians have collectively resulted in an increased density of outpatient clinics. The Central Physician Appointment System (CPAS) was introduced by the Ministry of Health in 2010 as part of the Health Transformation Project. The primary objectives were to reduce waiting times before examinations, reduce in-hospital crowding, direct patients to the appropriate outpatient clinics based on their complaints, and prevent the loss of physician workforce.^[1]

The CPAS can be accessed through various channels, including the support of the “182”

call center, internet, and mobile application. Additionally, it is available through hospitals and family physicians. The primary objective of the artificial intelligence-based “What is wrong with me?” application and operator system of CPAS is to generate appropriate appointments for patients who report their complaints, ensuring that they are directed to the right medical branch.^[2]

In Türkiye, the number of hospital admissions via appointments for 2022 was approximately

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110 million.^[3] However, the total number of examinations is significantly higher than this figure for the same year as indicated by the Health Services Utilization Statistics report.^[4] Despite its introduction to reduce overcrowding in outpatient clinics, the CPAS system has not fully met expectations in addressing appointment requests. Therefore, in addition to CPAS applications, outpatient clinic services are also provided to patients without appointments. In a single-center study assessing the effectiveness of the CPAS, the majority of outpatient clinic visits were reported to be conducted without an appointment.^[5]

Considering the rising number of outpatient clinic admissions and the growing workload of healthcare professionals, it is crucial to accurately guide patients to the appropriate outpatient clinics. The objective of the current study is to determine the rate of patients presenting to the cardiovascular surgery outpatient clinic who should have been referred to the cardiology outpatient clinic and assess the potential reasons for such instances.

Diagnostic tools such as echocardiography, rhythm Holter, and coronary angiography are within the domain of the cardiology department, utilized in the process of diagnosing cardiac symptoms and ultimately leading to surgical decisions. Therefore, initial referrals to the cardiovascular surgery outpatient clinic based on these symptoms have been termed incorrect referrals.^[6-8] This study aimed to determine the rate of incorrect referrals to the cardiovascular surgery outpatient clinic.

PATIENTS AND METHODS

Patients admitted to the cardiovascular surgery outpatient clinic at the Burdur State Hospital between July 1, 2021, and December 1, 2022, were retrospectively analyzed. Patients who were admitted to the cardiovascular surgery outpatient clinic before the study date were excluded. For patients with multiple admissions after July 1, 2021, only the initial application was considered. The admission records were then electronically reviewed and categorized into two groups: the incorrect referral group and the correct referral group. Incorrect referral was defined as patients who should have initially presented to the cardiology outpatient clinic for symptoms such as palpitations and exertional chest pain, echocardiography

follow-up, and routine cardiology check-ups. Age, sex, and CPAS usage were the other variables recorded in the study.

Statistical analysis

Statistical analysis was performed using IBM SPSS version 26.0 software (IBM Corp., Armonk, NY, USA) software. The Kolmogorov-Smirnov test was employed to assess the fitness of variables to a normal distribution. Due to the nonnormal distribution, the data were analyzed using nonparametric tests. When post hoc power analysis was conducted based on the attained sample size, the power was calculated as 88%, with an effect size (d) of 0.2 and an alpha (α) of 0.05. The data were analyzed using descriptive statistics (number, percentage, median, and interquartile range), the Mann-Whitney U test, chi-square test, and logistic regression analysis. The significance level was set at $p < 0.05$.

RESULTS

Among the 2,675 patients (1,540 females, 1,135 males; mean age: 53.3 ± 18.0 years; range, 5 to 97 years) meeting the inclusion criteria, 316 (11.8%) were classified in the incorrect referral group, while 2,359 (88.18%) were categorized in the correct referral group. Of the patients, 42.43% were male, and 57.57% were female. The median age in the incorrect referral group was 41 years, whereas it was 56 years in the correct referral group. There was statistically

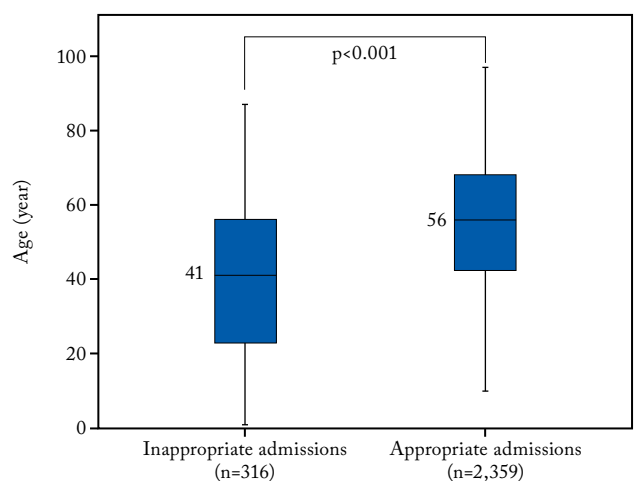


Figure 1. Age of patients in the incorrect and correct referral groups.

Table 1

Patient characteristics and distribution by groups

	Incorrect referral application (n=316)				Correct referral (n=2,359)				<i>p</i>
	n	%	Median	IQR	n	%	Median	IQR	
Age			41	33			56	26	<0.001*
Sex									0.295**
Male	139	12.25			996	87.75			
Female	177	11.5			1,363	88.5			
CPAS usage									<0.001**
Yes	259	18.63			1,131	81.37			
No	57	4.43			1,228	95.57			

IQR: Interquartile range; CPAS: Central Physician Appointment System; * Mann-Whitney U test; ** Chi-square test.

Table 2

Evaluation of the role of variables in predicting incorrect referrals using logistic regression

	Univariate			Multivariate		
	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>
Age	0.958	0.951-0.965	<0.001	0.961	0.954-0.968	<0.001
Sex	1.075	0.848-1.362	0.551			
CPAS usage	4.93	3.663-6.646	<0.001	4.34	3.209-5.886	<0.001

OR: Odds ratio; CI: Confidence interval; CPAS: Central Physician Appointment System.

significant difference between the two groups in terms of age ($p < 0.001$, Figure 1).

The variables pertaining to the incorrect referral and correct referral groups are presented in Table 1. The rate of incorrect referrals was 12.25% among the male patients and 11.5% among the female patients. There was no statistically significant relationship between sex and incorrect referrals ($p = 0.295$). The rate of incorrect referrals was 18.63% among patients who used the CPAS, whereas the rate was 4.43% in outpatient clinic visits without an appointment. There was a significant relationship between the use of the CPAS and the incidence of incorrect referrals ($p < 0.001$).

The role of variables in predicting incorrect referrals was evaluated through univariate and multivariate logistic regression analyses. Univariate logistic regression analysis revealed that younger age and CPAS use significantly predicted incorrect referrals ($p < 0.001$). Multivariate logistic regression model using age (odds ratio [OR]=0.961, 95% confidence interval [CI]: 0.954-0.968, $p < 0.001$) and CPAS use (OR=4.34, 95% CI: 3.209-5.886, $p < 0.001$)

showed that both age and CPAS use independently predicted incorrect referrals ($p < 0.001$, Table 2).

DISCUSSION

Early diagnosis, regular follow-up of chronic diseases, informing patients, and providing preventive medicine services are among the primary objectives of outpatient clinic examinations. According to the Health Services Utilization Statistics report, the number of applications to hospitals affiliated with the Ministry of Health for 2022 was approximately 375 million.^[4] Due to the disproportionate increase in the number of applications, patients are facing challenges in accessing healthcare services. Patients can receive appropriate healthcare services only if they can promptly apply to the right outpatient clinic. The CPAS developed by the Ministry of Health has been employed for this purpose since 2010. Despite its advantages, such as ease of use and the provision of services via mobile phones, call centers, and websites, the CPAS is inadequate in preventing incorrect referrals to outpatient clinics.

This is the first study to examine incorrect referrals to the cardiovascular surgery outpatient clinic. In our study, the rate of incorrect referrals to the cardiovascular surgery outpatient clinic was 11.5%. According to the Ministry of Health data, the reported rate of referral to an incorrect department was 6%.^[2] In a study evaluating referrals to the internal medicine outpatient clinic, the reported rate of incorrect referrals was 3%.^[9] Zorlu and Kavurmacı^[10] evaluated the rate of incorrect referrals among patients who presented to the thoracic surgery outpatient clinic via CPAS. In their study, the rate of patients who were referred to the thoracic surgery outpatient clinic when they should have been directed to the thoracic diseases outpatient clinic was approximately 6%. The rate of incorrect referrals found in the present study is significantly higher than the rates reported in the previous studies.

The incidence of one in 10 patient visits to the cardiovascular surgery outpatient clinic as an incorrect referral has several potential consequences: *(i)* delay in diagnosis and treatment of the patient; *(ii)* communication issue between the patient and physician; *(iii)* loss of labor force; *(iv)* patients who present to the correct department may not have the opportunity to be examined.

In a study conducted by Solmaz and Uluda,^[11] admissions to the cardiology outpatient clinic were analyzed, and the rates of admissions with noncardiac complaints were evaluated. The rate of admission with noncardiac complaints was significantly higher in the CPAS group than in the no-appointment group. Similarly, in our study, the rate of CPAS use was significantly higher in the incorrect referral group, and CPAS use was associated with a 4.34-fold increase in incorrect referrals. This situation contradicts the principles of time management and the appropriate referral to the right branch, which are the main objectives of CPAS. The high rate of correct referrals among patients presenting without an appointment can be explained by the effective functioning of in-hospital referral mechanisms. Some factors that may explain the high rate of incorrect referrals among patients who made appointments through CPAS are as follows. First, inadequate knowledge and low health literacy level of the patient may explain the appointment to the wrong branch. The second factor is the confusion in branch names. The term “cardiovascular surgery” is simpler and more understandable than “cardiology” when selecting a

specialty. Third is the misdirection caused by the CPAS. Patients who use CPAS by contacting the 182 hotline officials or the “What is wrong with me?” application may be directed to the cardiovascular surgery branch instead of cardiology.

Another finding of the study is the relationship between young age and incorrect referrals. Young age was associated with incorrect referrals independent of CPAS use. This could be explained by the likelihood that patients in the older age group are more health-conscious or have higher exposure to the healthcare system.

Steps for improvement identified based on the findings may contribute to the reduction of incorrect referrals to the cardiovascular surgery outpatient clinic. Some changes can be made in this direction. Professional associations should provide the public with accurate and understandable information about cardiovascular surgery and be active on social media platforms. The confusion in branch names should be eliminated. Furthermore, assessing the knowledge level of the 182 hotline employees and collaborating with professional associations to provide branch-specific information could lead to improvement. Finally, the artificial intelligence-supported “What is wrong with me?” application should be updated and developed to be consistent with developments in the field of health professionals and artificial intelligence.

Another intervention that can be implemented to prevent incorrect referrals, both for patients with appointments through CPAS and those without appointments, is the effective use of the healthcare level system. According to data from the Ministry of Health, only 40% of the over 850 million presentations made in 2022 were primary care admissions.^[4] This reveals that direct admissions to secondary and tertiary care are predominant. Directing patients to the right specialty and appropriate health center is among the primary objectives of family medicine practice.^[12] While there may be certain differences in each healthcare level, the primary purpose of family medicine often revolves around the referral chain. Numerous studies have demonstrated that the implementation of a referral chain decreases the number of outpatient clinic visits.^[13-15] The implementation of the referral chain is vital in preventing both unnecessary and incorrect admissions. According to Bektemur et al.,^[16] 85% of physicians in the family

medicine system stated that referral chain should be implemented, while only 55% believed that referral chain was feasible in Türkiye. We believe that improvements in the family medicine system and modifications to the referral chain system in Türkiye will be effective in preventing incorrect referrals.

This study has some limitations. The study was conducted in a single center. Multicenter studies examining incorrect outpatient clinic referrals may contribute to the overall understanding of the results. In the study, incorrect referral was defined as patients who should have initially presented to the cardiology outpatient clinic, which represents the second limitation of the study. The evaluation of all incorrect referrals to the cardiovascular surgery outpatient clinic may result in a rate that is significantly higher than the rate found in this study. The last limitation of the study is that it was conducted retrospectively. Surveys investigating the reasons why patients incorrectly present to the cardiovascular surgery outpatient clinic may contribute to revealing the existing problems with the appointment system.

In conclusion, healthcare workers are serving beyond their capacity due to the increasing number of patient admissions every day. This situation negatively affects both patients receiving services and healthcare professionals. The increasing demand for appointments over the years has resulted in a reduction in examination times. Although CPAS, developed by the Ministry of Health, is continuously improving in terms of preventing time wastage and providing accurate guidance with technological advancements, it alone is inadequate to prevent incorrect referrals. Developing systems to prevent incorrect referrals will ensure that the correct patients requiring services have access to healthcare earlier and protect health workers from unnecessary workload.

Ethics Committee Approval: The study protocol was approved by the Süleyman Demirel University Faculty of Medicine Clinical Research Ethics Committee (date: 12.01.2023 no: 1.6). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Idea/concept, design, data collection and/or processing: Ö.F.R.; Control/supervision, analysis and/or interpretation, literature review, writing the article, critical review, references, materials: Ö.F.R., F.A.

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