

Management of Patients via Telemedicine Who were Admitted to the Emergency Department in a Rural Settlement in Turkey

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ABSTRACT

Aim: There are a limited number of studies on the use of telemedicine by primary care physicians in Turkey. Our aim in this study was to investigate the consultation results of patients living in rural areas who were admitted to the district integrated hospital with chest pain and evaluated by a cardiologist by telemedicine.

Methods: This was a retrospective cohort study. The study was conducted with patients who came to the Emergency Department of Büyükorhan Integrated Hospital with chest pain. Emergency observation forms, electrocardiograms and cardiac blood markers (CK-MB, Troponin) were evaluated. The case group consisted of 50 patients who were consulted by a cardiologist. A control group was randomly selected among patients with chest pain who were admitted to the emergency department of the hospital in a similar time period but who were not consulted. Results of these consultations including two-year survival rates of the patients were evaluated.

Results: The rate of angiography and stent administration for patients consulted by a specialist cardiologist was significantly higher than in non-consulted cases. However, there was no difference in survival times of the consulted cases compared to the controls. Age was found to be a statistically significant factor when examining the causes that affected two-year survival of patients. Hypertension and coronary artery disease were associated with two-year mortality. Referrals, intensive care admissions and hospital admissions were also among the identified risks for two-year mortality.

Conclusions: According to the results of the current study, patient referral rates and interventional procedures increased with consultation. Although the increase in the number of referrals and diagnoses did not affect mortality, it is likely that it positively affected quality of life.

Keywords: Family medicine, chest pain, electrocardiogram, rural health, telemedicine.

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INTRODUCTION

Telemedicine is the use of electronic information and communication technologies in the provision of health services (1). When the literature is examined, it is seen that telemedicine has been used for more than 100 years (2). At the moment, for example, a brain surgeon in the United States can perform a herniated disc operation on a patient in a hospital in Bursa using robotic surgery. Thanks to telemedicine applications, geographical barriers are eliminated and health services can be provided in a wide area with limited resources.

With the application of telemedicine, accurate and fast access to patients can be provided in many specialties such as radiology, orthopedics, obstetrics and gynecology, internal medicine, surgery, cardiology and psychiatry (3-8). For example, with the possibility of remote access, psychiatric patients can be evaluated and treated without going to the hospital and without fear of stigma (9).

Telemedicine is also widely used in primary health care. The most common examples of this are known as electrocardiogram (ECG) consult and diabetes consult (10-11). ECG consult involves consultation of the patient's ECG record by the patient or physician. Blood sugar monitoring of diabetes mellitus patients is delivered to the physician by the patient and the physician can help the patient with blood sugar regulation. In patients with diabetes mellitus, for example, retinopathy examinations can be performed on the periphery and it can be facilitated to diagnose patients with images delivered to the ophthalmologist (12). Family physicians are able to consult their patients with specialist physicians by a telemedicine method and thus a better quality and accurate service can be offered at a lower cost.

There are a limited number of studies on the use of telemedicine by primary care physicians in Turkey. Our aim in this study was to investigate the consultation results of patients living in rural areas who were admitted to the district integrated hospital with chest pain and evaluated by a cardiologist by telemedicine.

METHODS

This study was conducted with patients who came to the emergency department of Büyükşehir Integrated hospital in the Büyükşehir district of Bursa province with chest pain. Ethics committee approval was obtained for the research. The patients were informed about the research and their consent was obtained.

A total of 100 patients, 50 cases and 50 controls, participated in the study. This research was a case-control study. In the study, emergency observation forms and ECG records taken when the patient applied to the emergency department and blood tests were performed. The patients were then consulted with a specialist cardiologist doctor. Depending on their condition, the patients were either followed up in the service or referred to the hospital in the provincial center by ambulance. In the continuation of the study, the status of angiography, intensive care hospitalization and survival of patients in the hospital where they went were investigated. In addition, two-year mortality of cases was also investigated. The control group was formed with the inclusion of the first patient admitted with chest pain after the patient who was consulted to the cardiologist.

Emergency observation forms are the follow-up forms of the standard Bursa health directorate in the emergency department. On this form the patient's first name, last name, arrival time, complaints, vital signs, blood pressure, pulse, fever, respiratory rate, Glasgow Coma score assessment, the doctor's order sheet, a

preliminary diagnosis, arrival time and departure time, entries of tests requested and treatments were recorded. When a patient applies to the emergency department, they are taken to the observation department, and the auxiliary medical staff is the first to establish a dialogue. When the patient is admitted for the first time, vital values are measured by the auxiliary medical personnel. These values are written on the emergency observation form. Then the patient is directed to a stretcher or a sick bed, depending on the nature of their condition. The doctor is then immediately notified. The doctor comes and evaluates the patient, and after this stage, the patient goes through the stages of anamnesis, examination, diagnosis and treatment.

In the study, three physicians consulted the cases, while another two physicians were managing their cases with their own experience. During the evaluation of the patient, the patient's anamnesis, findings, ECG, blood test values, vital values were sent to the cardiologist by telemedicine method. For the telemedicine method, the Whatsapp application used on mobile phones was used.

Statistical Analysis

The Shapiro–Wilk test was used to assess whether the variables followed a normal distribution. According to the normality of distribution, variables were reported as mean±standart deviation values. The independent samples t-test was used to compare continuous variables, whereas the chi-square and Fisher-Freeman-Halton tests were used to compare categorical variables. Statistical analyses were performed using SPSS version 23.0 (SPSS Inc., Chicago, IL, USA). A p-value of 5% was considered statistically significant for all statistical comparisons.

RESULTS

The sociodemographic characteristics of the case and control groups are given comparatively in Table1.

Examining the chronic diseases of the patients in the case group and the control group, there was no significant difference between the two groups (Table2).

Statistically significant differences were observed between the follow-up results of the participants (Table3).

Table 1. Comparison of general characteristics of the case and control group

			Case	Control	p-value
Age	Mean		62.70	68.86	0.053
	Standard deviation		15.62	14.24	
Gender	Male	Number of cases	37	25	0.013
		%	74.0	50.0	
	Female	Number of cases	13	25	
		%	26.0	50.0	
Marital Status	Married	Number of cases	42	41	0.483
		%	84.0	82.0	
	Single	Number of cases	3	1	
		%	6.0	2.0	
	Divorsed	Number of cases	5	8	
		%	10,0	16,0	

Occupation	Farmer	Number of cases	16	17	0.153
		%	32.0	34.0	
	Tradesmen	Number of cases	2	2	
		%	4.0	4.0	
	Worker	Number of cases	10	4	
		%	20.0	8.0	
	Officer	Number of cases	3	1	
		%	6.0	2.0	
	Retired	Number of cases	3	1	
		%	6.0	2.0	
	Unemployed	Number of cases	14	24	
		%	28.0	48.0	
	Student	Number of cases	2	0	
		%	4.0	0.0	
Education	Illiterate	Number of cases	13	14	0.877
		%	26.0	28.0	
	Literate	Number of cases	12	15	
		%	24.0	30.0	
	Primary school	Number of cases	18	17	
		%	36.0	34.0	
	Secondary school	Number of cases	3	3	
		%	6.0	6.0	
	High school	Number of cases	3	1	
		%	6.0	2.0	
	University	Number of cases	1	0	
		%	2.0	0.0	

Table 2. Distribution of chronic diseases of the participants

			Case	Control	p-value
Hypertension	No	Number of cases	16	11	0.260
		%	32.0	22.0	
	Yes	Number of cases	34	39	
		%	68.0	78.0	
Diabetes Mellitus	No	Number of cases	38	33	0.271
		%	76.0	66.0	
	Yes	Number of cases	12	17	
		%	24.0	34.0	
Coronary Heart Disease	No	Number of cases	37	40	0.476
		%	74.0	80.0	
	Yes	Number of cases	13	10	
		%	26.0	20.0	

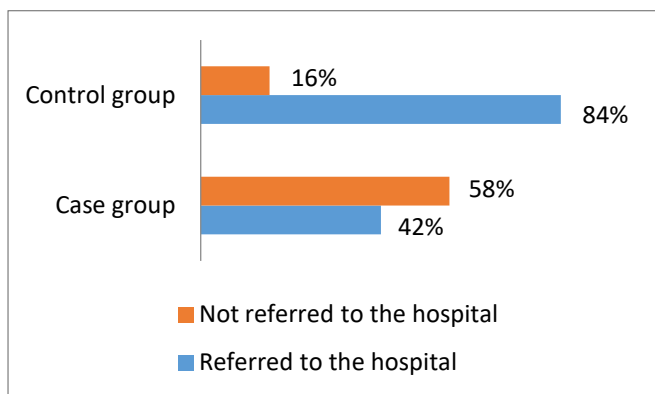
Cerebrovascular Disease	No	Number of cases	47	49	0.617
		%	94.0	98.0	
	Yes	Number of cases	3	1	
		%	6.0	2.0	
Hyperlipidemia	No	Number of cases	40	34	0.171
		%	80.0	68.0	
	Yes	Number of cases	10	16	
		%	20.0	32.0	
Chronic Obstructive Pulmonary Disease	No	Number of cases	43	42	0.779
		%	86.0	84.0	
	Yes	Number of cases	7	8	
		%	14.0	16.0	

Table 3. Case and control group two-year follow-up results

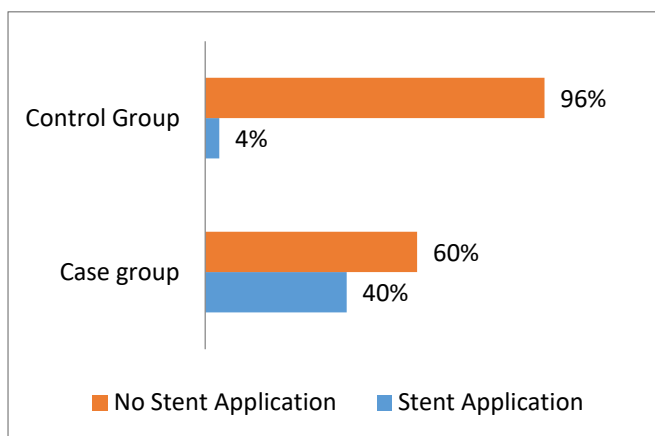
			Case	Control	p-value
Referral to the hospital	No	Number of cases	21	42	<0.001
		%	42.0	84.0	
	Yes	Number of cases	29	8	
		%	58.0	16.0	
Angiography	No	Number of cases	22	47	<0.001
		%	44.0	94.0	
	Yes	Number of cases	28	3	
		%	56.0	6.0	
Stent application	No	Number of cases	30	48	<0.001
		%	60.0	96.0	
	Yes	Number of cases	20	2	
		%	40.0	4.0	
Intensive Care Unit	No	Number of cases	44	47	0.487
		%	88.0	94.0	
	Yes	Number of cases	6	3	
		%	12.0	6.0	
Hospitalization (days)	Mean		0.66	0.14	0.166
	Standard deviation		2.02	0.61	
	Median		0.00	0.00	
	Minimum		0.00	0.00	
	Maximum		10.00	3.00	

The referral status was compared between the case and control groups. The referral rate was found to be significantly higher in the case group (Graph1).

The stent procedure applied to the case and control groups is shown. While 40% of the case groups had stents inserted, only 4% of the control group had stents inserted. 96% of the control group did not have a stent inserted (Graph2).

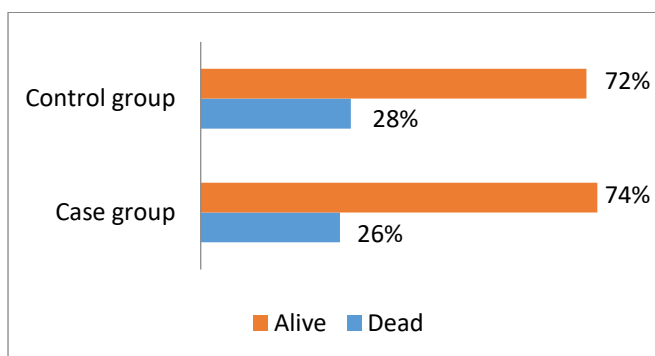


Graph1. Referral status in case and control groups



Graph2. Stent application rates in case and control groups

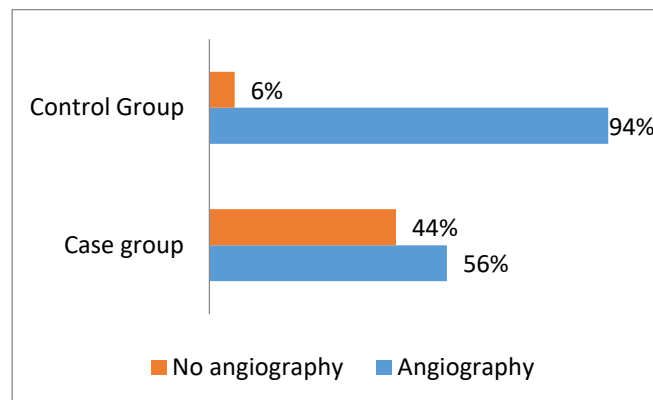
The mortality rates in the case and control groups are given. There is no significant difference between the groups (Graph3).



Graph3. Mortality rates in case and control groups

Graph 4 shows the rates of angiography procedures performed in the case and control groups. Accordingly, angiography was performed at a rate of 56% in the

case group, while it was performed at a rate of 6% in the control group.



Graph4. Rates of angiography performed in case and control groups

DISCUSSION

As a result of our research, a significant difference was found between the cases of patients admitted to the emergency department of the integrated hospital with chest pain and evaluated by a family doctor and who were consulted with a cardiologist, and those who were not referred to the hospital in the city center. The rate of angiography and stent application for patients who were consulted by a specialist cardiologist was significantly higher than the cases who were not consulted. However, there was no difference between the mortality and survival rates of the cases consulted with cardiology. When the reasons affecting the two-year survival of patients were examined, age was determined as a statistically significant factor. Of the chronic diseases, hypertension and coronary artery disease were associated with two-year mortality. Referral, intensive care admission and hospital stay durations were also among the risks identified for two-year mortality. It was observed that there was no significant difference in mortality between the groups when the referred and non-referred patients were compared in the case and control groups.

In a review study conducted by Brunetti and colleagues with 566 articles, it was argued that telemedicine applications can be used in cardiology for heart failure, ischemic heart disease and arrhythmias (13). In some studies, it is stated that the potential cost-effectiveness of telemedicine applications in cardiology should be further investigated (14). In our study, only patients who presented with chest pain were consulted. When this study is evaluated, in which we aimed to assess acute ischemic heart disease with Glasgow Coma scores, it was seen that the referral rates and interventional procedures were much higher than the cases that were not consulted. In this study, which we cannot evaluate as cost-effective with this form, there were probably too many cases of chronic ischemic heart disease among acute cases that could not reach a cardiologic examination in any way. Patients with chronic ischemic heart disease who were not yet diagnosed before the examination may thus have been diagnosed with the contribution of our study.

In the study conducted by Mathur et al., criteria such as difficulties in accessing health care in rural areas and adequate awareness of patient diseases was studied, and the importance of criteria such as transportation and distance among the reasons for delays in the treatment of patients in rural areas has been shown (15). In our study, as the reason for the high rate of interventional procedures performed on patients, it can be considered that these patients should be evaluated, diagnosed and treated in an outpatient clinic under normal conditions, while people apply to the emergency department at a later stage, perhaps due to the difficulty of both distance and means of transportation in a rural area. It is possible that in cases that are probably not referred, if a group is referred to a heart hospital in the city center, there may also be those who resort to interventional diagnostic methods.

Consulting ECG with telemedicine methods can be done in many ways (16,17). ECG can be consulted by telemedicine methods for in-hospital consultations. Similarly, consultations can be provided from hospital emergency departments or centers outside the hospital, where there may be requests for support for ECG interpretation from family physicians. In current applications, case discussions with the seniors of the hospital watch the team via a smartphone messaging system as a convenience provided by technology to the health service. In our study, there was an ECG consultation from an integrated hospital emergency doctor who came to the emergency department. In the patients included in the study, there was no evaluation only by ECG. In addition to the ECG outputs of the patients, the laboratory results were also effective in the evaluation. The approach of the physicians in the emergency department in cardiac cases follows an algorithm limited by the available possibilities. It can be assumed that the experience of physicians also has an impact on the approach to cases. In our study, three physicians consulted the cases, while another two physicians were managing their cases with their own experience. Although patients who come with chest pain were among our criteria for inclusion in the study, our physicians who included patients in the case group may have consulted their more critical patients with a decisional cardiologist. Thus, the rate of referral and interventional interventions may have increased in the consulted patients.

In our study, it is seen that referral, hospitalization and intensive care admissions in patients with acute coronary syndrome have an effect on the mortality of patients. In a study conducted by Dar and et al., when looking at the mortality rates of patients with acute coronary syndrome, it was found that intensive care admissions were consistent with the mortality rates of

patients. This may be related to the fact that the disease is serious at an advanced level (18).

According to the results of the current study, patient referral rates and interventional procedures increased with consultation. Although the increase in the number of referrals and diagnoses did not affect mortality, it is likely that it positively affected quality of life.

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Conflict of interest

Author has any conflict of interest to disclose

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