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Effectiveness of ECG Telemetry Technology in Preventing Myocardial Infarction in Patients with Acute Coronary Syndrome

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Abstract: This study evaluates the clinical effectiveness of ECG telemetry technology in the early diagnosis and prevention of myocardial infarction in patients with acute coronary syndrome (ACS) in the Fergana region. A total of 48 patients who contacted the ambulance due to chest pain were included. Each patient underwent an ECG examination at the site of the call, with the results transmitted in real-time to regional or national cardiologists via telemetry. ST-segment elevation was detected in all cases, and patients were promptly referred to specialized cardiology centers for coronary angiography and stenting within an average of 2.2 ± 1.1 hours. Statistical analysis revealed that none of the patients developed myocardial infarction, disability, or death (0%). Most of the patients were male (77.1%) and over the age of 60 (54.2%). Hypertension was present in 100% of patients, followed by obesity (56.3%), smoking (39.6%), hereditary predisposition (27.1%), and diabetes mellitus (12.5%). The results highlight the high preventive value of ECG telemetry in managing ACS, especially among high-risk groups. The integration of digital diagnostics with a coordinated ambulance system significantly improved clinical outcomes and demonstrates the potential for widespread implementation in regional emergency response systems.

Keywords: ECG telemetry, acute coronary syndrome, prevention of myocardial infarction, ambulance, remote cardiologist consultation, coronary angiography, cardiovascular risk factors, ST-segment elevation, digital integration, telemedicine, cardiac disease diagnostics, Fergana region.

Introduction: Cardiovascular diseases represent one of the most significant challenges in modern medicine, being directly linked to both the duration and quality of human life. In particular, acute coronary syndrome (ACS) is a severe clinical condition characteristic of ischemic heart disease, resulting from inadequate blood supply to the myocardium. ACS cases often present with myocardial infarction, ventricular arrhythmias, ST-segment elevation, and acute heart failure. If not identified in a timely manner and treated with appropriate ambulance intervention, such conditions may lead to death or irreversible disability.

According to statistical data published by the World Health Organization (WHO), in 2023 more than 18 million people worldwide died due to cardiovascular diseases. This underscores the fact that this group of diseases remains a pressing medical and social issue not only in developing but also in developed countries. For this reason, the integration of advanced technologies into clinical practice — particularly those

expanding early diagnostic capabilities — has become an urgent necessity.

One of the innovative approaches widely implemented in recent years is ECG telemetry technology. Using this method, ambulance teams record the patient's cardiac activity at the site of the call using an ECG and transmit it in real time to a specialized cardiologist. This enables accurate and rapid diagnosis, timely receipt of medical recommendations, and the immediate transfer of the patient to a specialized treatment facility. Early detection of infarction risk through this system, and the availability of timely stenting, play a crucial role in the prevention of myocardial infarction.

Objective

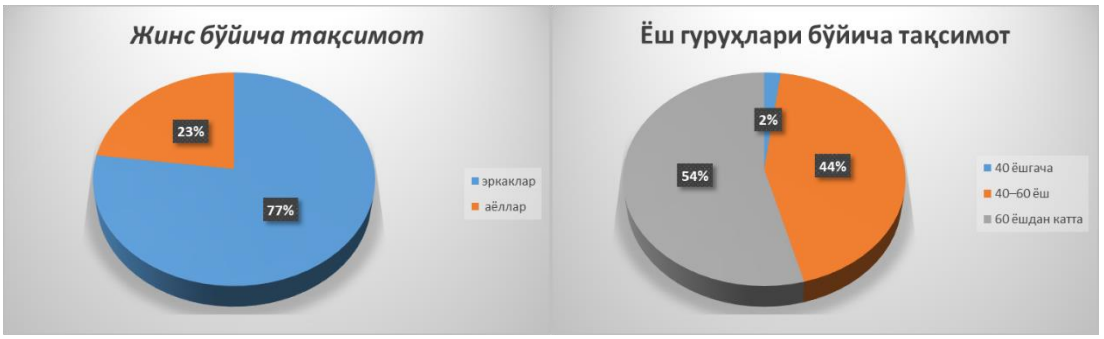
The main objective of this study is to determine the clinical effectiveness of using ECG telemetry technology for the early diagnosis of acute coronary syndrome (ACS) at the site of emergency calls and to prevent myocardial infarction through remote cardiologist consultation.

In addition, within the framework of this study, the practical implementation of the ambulance algorithm based on ECG telemetry, the time required for hospital delivery, the speed of diagnosis and stenting, the influence of risk factors, and differences related to the age and sex of the patients are analyzed. The results obtained will help to determine the preventive effectiveness of this technology at the regional level.

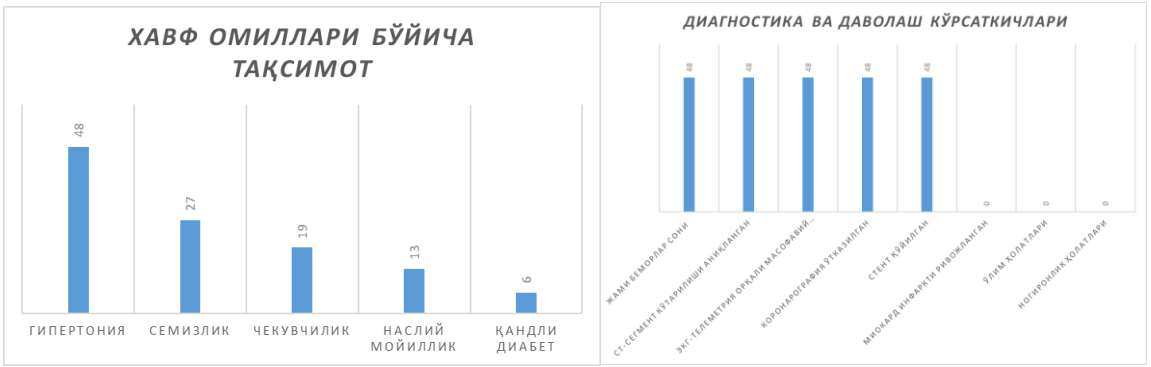
METHODS

In this study, the term "ambulance" is used to denote the integrated emergency medical care services including dispatch, on-site examination, remote consultation, and hospital transport.

The study was conducted from August 13, 2024, to February 13, 2025, in the Fergana region by the Fergana Regional Branch of the Republican Ambulance Center. A total of 48 patients who contacted emergency medical services with chest pain were selected as the study subjects. All patients were included in a random sequence, and only cases suspected of ischemic heart disease were analyzed [1, 2, 3].



Each patient underwent an electrocardiographic examination (ECG) at the site of the emergency call. The obtained ECG results were transmitted in real time via telemetry to specialists at the Fergana Regional Cardiology Center or to remote cardiologists at the national level. All patients with detected ST-segment elevation were immediately referred to a specialized cardiology facility and hospitalized within an average of 2.2 ± 1.1 hours. In the hospital, all of them underwent coronary angiography, and coronary stents were implanted.



Patients were analyzed according to age groups (under 40 years, 40–60 years, over 60 years), gender (male/female), and key risk factors—arterial hypertension, obesity, smoking, diabetes mellitus, and hereditary predisposition. All statistical data collected during the study were analyzed using the SPSS 25.0 software. The data were presented in the form of percentages and mean values. [4, 5, 6].

RESULTS

In all 48 patients analyzed within the study, i.e., in 100% of cases, ST-segment elevation was detected through ECG examinations, indicating myocardial oxygen

deficiency and a high risk of infarction development. These findings were identified by the ambulance team at the site of the call and transmitted via telemetry to cardiology specialists at the regional or national level. Each patient's ECG results were evaluated remotely in real time, and the probability of infarction was assessed as high.

According to the analysis, all patients (48 individuals, 100%) were reviewed remotely by a cardiologist based on the diagnosis established via ECG telemetry and were promptly referred to specialized cardiology centers for emergency coronary angiography. During angiography, coronary artery stenosis was confirmed in all patients, and stents were placed according to modern clinical standards. As a result of these interventions, the development of myocardial infarction was successfully prevented.

The time taken to transport patients to the hospital is also considered an important diagnostic indicator. According to the study, patients were delivered to the hospital within an average of 2.2 ± 1.1 hours. This outcome reflects the effectiveness of ECG telemetry technology and the rapid coordination within the ambulance system.

The results were positive, as none of the 48 patients observed developed myocardial infarction, death, or disability (0%). These outcome indicators clearly demonstrate the high efficiency of the technology and inter-service collaboration.

The following trends were identified regarding the main risk factors among the patients:

- Hypertension — present in all 48 patients (100%), being the leading risk factor in cardiovascular disease.
- Obesity — observed in 27 patients (56.3%), contributing to increased cardiac workload.
- Smoking — present in 19 patients (39.6%), being one of the main factors in arterial narrowing and reduced oxygen delivery.
- Hereditary predisposition — detected in 13 patients (27.1%).
- Diabetes mellitus — observed in 6 patients (12.5%), considered a factor that worsens myocardial metabolic condition.

In terms of gender distribution, the majority of patients were male, with 37 individuals (77.1%), while females accounted for 11 individuals (22.9%). This reflects the relatively higher prevalence of cardiovascular diseases among men.

With regard to age, 26 patients (54.2%) were over 60 years old, highlighting the increased risk of heart diseases in this age group. Patients aged 40–60 years made up 21 individuals (43.8%), while only 1 patient (2.1%) was under 40 years of age. This clearly confirms that the incidence of cardiovascular diseases increases with age. [6, 7].

CONCLUSION

Based on the above analysis, it can be confidently stated that the diagnostic approach based on ECG telemetry technology demonstrated exceptionally high effectiveness in preventing myocardial infarction, death, and disability among patients with acute coronary syndrome (ACS). Despite ST-segment elevation being present in all 48 patients included in the study, none of them developed infarction, no deaths were recorded, and there were no complications leading to disability.

These outcomes clearly reflect the accurate and consistent functioning of digital integration between the ambulance system and specialized cardiology centers. The prompt execution of ECG by the emergency team, obtaining remote cardiology consultation via telemetry, and transporting the patients to the hospital in less than two hours based on the diagnostic outcome significantly contributed to preserving the patients' lives and health.

Furthermore, this approach showed that it is possible to prevent clinical complications even in the presence of severe risk factors. It clearly demonstrates the preventive value and clinical benefit of ECG telemetry technology, especially in populations where hypertension, obesity, smoking, diabetes, and hereditary predispositions are present.

From a practical standpoint, the broader implementation of ECG telemetry technology across wider regions and the full digital equipping of all emergency medical teams may become one of the key factors in saving patients’ lives.

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