

ORIGINAL ARTICLE

Problems and Prospects in Development of Emergency Medical Help Center in OSH, Kyrgyzstan

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ABSTRACT

This article is presenting an analysis of emergency medical center work in Osh city, Kyrgyzstan for a five-year period. Ambulance crew visits indicators from 2016 to 2020 were studied in the Kyrgyz Republic, and in Bishkek and Osh cities, visit numbers monitoring in Emergency Medical Help Center in Osh carried out with a delay of more than 20 minutes, was carried out using statistical test forms from 2016 to 2020 years and proposed measures to improve emergency quality in medical help providing to a population in Osh city. Statistical and analytical methods were used including dynamic analysis of time series, correlation and regression analysis, data processing carried out using application programs. Comparison of average Republican indicator of load on ambulance crews revealed teams load in Osh city 46443 calls, with 68100 calls exceeding the average Republican indicator by 35%, and shows the overload of EMH service mobile teams in Osh.

Keywords: emergency medicine, paramedic, mobile teams, trips, optimization, lateness.

INTRODUCTION

The issues in improving emergency medical care in Kyrgyzstan are relevant in the healthcare system. This is primarily due to the increased need for emergency medical care both at the prehospital and hospital stages over the past decade^{1,2,3}. The ambulance service in the Kyrgyz Republic does not meet modern standards in terms of its functioning, tasks and does not meet the needs and requirements of population. In most cases, the Emergency Medical Help (EMH) service transports patients to the nearest healthcare organization and is not able to fully provide qualified medical care for the population in urgent and life-threatening conditions. The role, place and approaches of financing EMH service are not sufficiently defined, which does not guarantee quality provision in medical care to the population⁴.

The structure of ambulance calls is based on sudden illnesses (primarily cardiovascular and neurological diseases), accidents, injuries and poisoning. They are the main causes of morbidity and mortality in the prehospital stage, so it is clear that effective ambulance work service plays a critical role in improving the health outcomes of population⁵.

EMH differs from other types of medical care by structure, organization and activities in emergencies at a prehospital level. Despite a quarter of a million cases of calls made by teams, the EMH service has several problems and difficulties^{6,7,8} in providing emergency medical help to the Osh city population, including low technical equipment, problems of insufficient capacity and competence of the EMH service to provide emergency help and timely transportation of patients to specialized institutions. Emergency medical help is the first level health care provided in out of hospital medical emergency

departments and medical emergency system is an important chain in public health management⁹.

The timely medical assistance provided to sick, injured in full, and at the earliest possible time is a decisive factor in saving their lives. The foregoing determines the relevance of this study, the need for a detailed study of the activities of the EMH service in Osh city to improve the emergency medical help quality and coverage provided to population. The EMH system in the Kyrgyz Republic, according to information received by the beginning of 2020, has 2 centers and 137 departments of emergency and emergency medical care among which 1 center operates in Osh city.

This work's purpose was to identify problems and prospects in emergency medical help center service development in Osh city to improve the emergency medical help quality provided to population.

The main tasks are following:

- 1 To study the indicators of visits of emergency and emergency medical help in the Kyrgyz Republic, in Bishkek and Osh from 2016 to 2018 years, as well as visits made by field teams of the EMHC in Osh with a delay of more than 20 minutes;
- 2 Justify the need to open additional substations and introduce an automated control system for the dispatch department of the EMHC in Osh city;
- 3 Analyze delays depending on distance, traffic jams on the roads during peak hours.

MATERIALS AND METHODS

Reporting forms No. 40 of Kyrgyz Republic Health Ministry on "Department of Emergency Medical Assistance Center Report", statistical data in work of emergency mobile teams and emergency medical help from 2016 to 2020 years per 1000 population (5 years) were used. The visits of the

EMHC in Osh, which was more than 20 minutes late was investigated. All trips were divided into 3 groups: I (research) group made up the departure indicators in Osh city per 1000 population; the data of field teams in the republic made up the II (comparative) group, the III group included the indicators of field trips in Bishkek.

Statistical and analytical methods are used according to dynamic analysis of time series, correlation and regression analyses. Data processing was carried out using Microsoft Excel application programs.

RESULTS AND DISCUSSIONS

Analyzing statistical data on emergency and emergency medical help¹⁰ visits in the Kyrgyz Republic and Bishkek with Osh cities from 2016 to 2020 years, it can be noted that the number of cases of servicing mobile teams in the republic, which determine the III rd research group, remained within the same values as in the year 2016 (101.8 per 1000 population).

The II nd research group included trips in the city of Bishkek (150.8 per 1000 population) for 2016, respectively, with a slight increase in the 2017 year by 7.7% compared to the number of trips in 2016. And in the I st investigated group, the number of trips to Osh in the 2017 year amounted to 271.6 per 1000 population, with a downward trend in the 2018 year to 231.5 per 1000 population, which is 17% compared to the year 2016.

The decrease in the number of calls from the 1st research group since 2017 is associated with the revision of the clear boundaries of the service of EMH in Osh city based on an agreement with the Compulsory Health Insurance Fund withdrawal of nearby villages in Kara-Suu district from a system of emergency medical help service (EMH) in Osh. The number of emergency and urgent medical help visits in the Kyrgyz republic and cities of Bishkek and Osh for 2016 to 2020 years shown in Table 1.

Table 1: Number of emergencies and urgent medical care visits, by republic and cities Bishkek and Osh from 2016 to 2020 years.

Region	Absolute number					To 1000 population				
	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
Kyrgyz Republic	618979	635618	639996	635186	595938	101.8	102.5	101.2	98.4	90.6
Bishkek	146233	161026	154065	156319	140966	150.8	162.4	151.8	150.2	132.5
Osh	75728	67697	68100	65592	53486	271.6	237.2	231.5	214.3	168.5

As Table 1 shows, in 2016 call indicators in the group, I was increased, and when comparing the number of calls in groups I and III, 2.5 times more trips were detected in Osh. Compared to the Kyrgyz Republic indicator, and 120.8 more calls per 1000 population were made compared to the rates of departures in Bishkek.

With a detailed study of indicators in emergency calls in Osh city, a dynamic analysis of time series (Table 2) shows a decrease in the number of calls from 2016 to 2020 by 21.4%. The decrease in the number of calls from 2019 to 2020 is associated with COVID-19 pandemic, during which mobile teams organized at operational headquarters in Osh city to combat coronavirus infection, which replaced the duties of an emergency medical center serving the population with symptoms of coronavirus infection.

According to the Kyrgyz Republic Health Ministry reports for 2016 to 2018 years, there were 689 brigades in the Kyrgyz Republic and by the 2020 year, their number was increased to 700. In Osh city from 2016 to 2020 years, the number of brigades varied from 50 to 52. In recent years, the city has grown territorially and EMH service in Osh serves more than 700 thousand people Table 2. Dynamical analysis on the ambulance departure numbers from 2016 to 2020 years in Osh city.

Years	Indicators	Visibility indicator, %	Growth indicator (decrease), %	Growth rate (decrease), %	Interval gross method
2016	271.6	100.0	No	No	254.4
2017	237.2	87.3	87.3	-12.7	
2018	231.5	85.2	97.6	-2.4	222.9
2019	214.3	78.9	92.6	-7.4	
2020	168.5	62.0	78.6	-21.4	

together with nearby villages. According to the regulations, there should be one ambulance per 10,000 people¹¹. Based on the population served in the city of Osh, there should be 70 round-the-clock teams.

Correlation coefficients have inferential properties and in scientific texts, should preferably be expressed with their 95% confidence intervals and significance (p-value), for example, $p = 0.76^{12,13}$. In the case of multiple comparisons. The data obtained from Table 3 allow us to determine the Pearson correlation coefficient, which is equal to 0.806. Comparing obtained analysis with the Chaddock scale correlation, we establish a high correlation between the number of teams and the number of emergency calls ($0.7 < r_{xy} > 0.9$).

Table 3: Correlation analysis between team and emergency call in Osh city from 2016 to 2020 years according to Pearson correlation coefficient.

Years	x	x-x	(x - \bar{x}) ²	y	y-y	(y - \bar{y}) ²	(x-x)*(y-y)
2016	50	-1	1	271.6	+49.98	2498.0	-49.98
2017	50	-1	1	237.2	+12.58	158.26	-12.58
2018	50	0	0	231.5	+6.88	47.3	0
2019	52	+1	1	214.3	-10.32	106.5	-10.32
2020	52	+1	1	168.5	-56.12	3149.5	-56.12
Σ	255	-	4	1123.1	-	5959.56	-129
Average	51	224.62	-	-	-	1192	-25.8

Notes: x- teams numbers, y- emergency call numbers
 If we compare the average republican indicator of load on ambulance crews, then a load of teams in Osh city should be 46443 calls, with 68100 calls made, which exceeds the average republican indicator by 35%, and shows the overload of mobile teams of the EMH service in Osh.

Due to the lack of crews, there is a problem of being late for a call. When analyzing departures with a delay of more than 20 minutes, a large radius of EMH service in Osh was revealed, the distance, which is 35 to 75 km. Figure 1 is showing monitoring of calls with a delay of more than 20 minutes from 2016 to 2018 years in Osh.

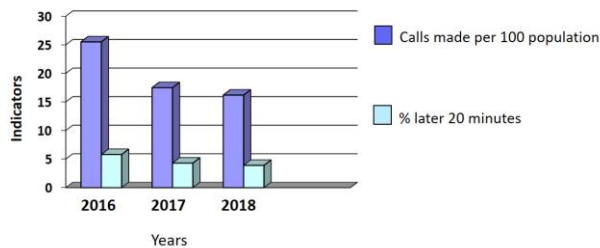


Figure 1: Indicators of emergency calls made per 100 served population and calls made after 20 minutes in Osh from 2016 to 2018 years.

During years from 2016 to 2018, serving with a delay of 20 minutes in Osh was about 25%. Out of all calls analyzed, late calls registered in Manas-Ata and Amir-Temur micro districts, the distance of which is from 12 to 30 km, respectively. These are only micro districts belonging to the territory of the 2nd capital.

The settlements of Karasu district, located closer to Osh city, such as Ishkavan, Kyzyl Bayrak, Kyzyl Kyshtak, Toloikon, Ozgur and Nariman, which serve the Osh city emergency service, are worked with a delay of more than 20 minutes in almost 80% of cases. The reason for this is an increase in the vehicles number in Osh in recent years, which creates traffic jams on roads and negatively affects service.

A project for the introduction of an automated control system of EMH service in Osh was planned. The project implies a reduction in the processing time of applications by dispatchers, reports on the number of trips completed for any period, on the number of people who received medical assistance, reducing the time spent by the brigade on the road, standardizing the time spent by the brigade with patients, more efficient use of personnel, technical and material resources, as well as accurate information about the efficiency of the station.

Based on studied results, it can be recommended to accelerate the introduction of an automated control system, thanks to which the teams will reach the calls of the first category (car accidents, life-threatening conditions), where the standard of arrival is 20 minutes, much faster.

CONCLUSIONS

Thus, results in this work prove congestion of EMHC work in Osh at a range of service radius of station and justify the need to open additional substations in Manas-Ata and Amir-Temur micro districts. All delays depend on distance, traffic jams on roads during peak hours and the employment of field teams, which requires the acceleration of the introduction of an automated control system in the EMHC in Osh. Implementation of this project will improve the emergency medical help quality for the population in Osh city.

Author contributions: Fatima Ismailova collected statistical data, analyzed emergency medical help center services from 2016 to 2020 years. Madaminzhan Karataev analyzed departures and helped with research method choice. Gulina Omukeeva, Nurgul Omorova, Syed Ali Abbas Rahat, Ulanbek Satarov, Aizirek Satybaldieva contribute to article publication fee payment. Zhympargul

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