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Analysis of interventions, location and number of emergency medical service teams in operational area 14-04 in 2015-2018.

Summary

Introduction

In the modern world, providing effective medical assistance in situations of sudden threat to life and health is one of the basic duties of the state. In Poland, this obligation is implemented through the State Emergency Medical System. An important element of this system are emergency medical service teams (EMS), located on the territory of the country in operational areas (OA) created by individual voivodes.

Purpose

The main objective of the work was a retrospective analysis of the emergency medical service teams interventions, assessment of the correctness of their distribution and estimation of their appropriate number in the counties of eastern Mazovia: Garwolin, Łosice, Mińsk (without the municipality of Halinów and the city of Sulejów), Siedlce land and magistrate districts, Sokołów, Węgrów, and in the municipalities of Jadów and Strachówka in the Wołomin county, constituting the operational area 14-04.

The specific objectives of the work included:

1. Determination of the distribution of EMS interventions based on calls to cities with more than 10,000 inhabitants (urban area) and outside such areas (rural area), the urgency code, place of call, place of patient transfer/end of activities, time of intervention (season, month, day of the week, hours), age group and gender of the patient.
2. Determination of the relation between the area of the call (urban, rural) and the urgency code, place of call, place of transfer of the patient / end of activities, time of intervention (season, month, day of the week, hours), age group and the sex of the patient, the population inhabiting the OA.
3. Indication of the relation between intervention area (urban and rural area), the urgency code, season, patients' sex and group of age, and the groups of codes according to the International Classification of Diseases (ICD-10).

4. Showing the relation between the intervention area (urban and rural area), the urgency code, season, gender and age group of patients, and the 20 most common diagnoses according to the ICD-10 codification.
5. Determination of whether the times of EMS arrival to the place of the incident in OA 14-04 were in accordance with the standards set out in Article 24 of the Act on State Emergency Medical System (Journal of Laws of 2006 No. 191 item 1410)?
6. Determining whether the deployment of EMS in OA 14-04 is appropriate for the proper functioning of the system?
7. Showing whether the amount of EMS in OA 14-04 is sufficient for the proper functioning of the system?

Material and methods

The study on EMS interventions stationed in OA 14-04 was conducted on the basis of a retrospective analysis of data from computer systems operating in Meditrans Kamssoft - The Basic Program of the Healthcare Provider and Asseco Medical Management Solutions and from medical documentation kept by EMS (Departure Order Card and Medical Emergency Activities Card), in the period from January 1, 2015 to December 31, 2018. The data from computer systems concerned: calls to cities with more than 10,000 inhabitants and outside such areas, date and time of departure, age, sex of the patient, and the diagnosis made according to the code of ICD-10, and from medical documentation: place of call (home, public place, traffic, work, clinic, etc.), urgency code, further treatment of the patient.

To analyze the number and location of EMS, statutory times of arrival at the place of the event (median, 3 quartile, maximum time of arrival) and indicators (amounts of EMS per 100000 inhabitants, amounts of EMS per 100000 inhabitants based on population density per 1km² and number of EMS trips per 1000 inhabitants) were used.

For analyses based on the area (urban, rural), urgency code, place of call, patient handling, number of calls in individual seasons, months, days of the week and hours, all interventions of EMS OA 14-04 from the study period (n=155993) were used. Examining the calls depending on the sex and age group of the patient and the diagnosis made according to the ICD-10 code, 147857 EMS interventions were analyzed, and in the case of statutory times of EMS reaching the place of the incident 153152.

The obtained data was collected in the Microsoft Excel MS Office 2019 database for Windows10 and subjected to statistical analysis using TIBCO's STATISTICA 13.3 program.

Results

On the basis of my own research, it should be stated that in the analyzed period in OA 14-04 the number of EMS interventions in both urban and rural areas increased. The research showed a statistically significant relationship between the area of intervention (urban, rural) and numerous factors. Factors such as the urgency code, the place of the call, the season, the month, the day of the week, the hours, gender, age and then the way in which the activities are completed (the place of the patient transmission) determine the operation of the EMS and have a significant impact on it.

On the other hand, the distribution of interventions in patients from different age groups in OA 14-04, and taking into account the urban and rural area is not identical with the population distribution, as the population ages, the number of EMS interventions in individual age ranges increases.

It is most likely that due to the ambiguity of symptoms and limited diagnostic capabilities, EMS most often make diagnoses based on ICD-10 codes from the group *R-Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified* (37,72%), which contain a number of diagnoses concerning various systems. Thereafter, the most common are diagnoses from the group *S-T,V-Y-Injury, poisoning and certain other consequences of external causes, external causes of morbidity and mortality* (24,44%) and *I-Diseases of the circulatory system* (15,74%). The groups of ICD-10 codes used by the EMS determine the area of intervention (urban and rural), the urgency code, the time of year, the sex and the age range of the patient.

In the examined period, the 20 most common diagnoses made by EMS based on ICD-10 codification represent 55,56% of all diagnoses. The first four most common diagnoses account for 24,76% of all diagnoses and they are *R55-Syncope and collapse* (7,67%), then *R07-Pain in throat and chest* (5,89%), *R10-Abdominal and pelvic pain* (5,85%), and *I10-Essential (primary) hypertension* (5,35%). Like the ICD-10 code groups, individual diagnoses indicate a statistically significant dependence on the area of intervention (rural and urban), the urgency code, the season, gender and the age range of the patient.

The time of arrival at the venue of the incident by EMS in urban areas (median - 8 minutes, 3 quartile - 12 minutes) met the statutory standards, however, in all months of the examined period, the maximum time of arrival (15 minutes) was exceeded, exceedances reached a minimum of 1,38% and a maximum of 11,95% of EMS trips surveyed on a monthly basis. In the case of rural areas, the median (15 minutes) was exceeded in 24 and 3 quartile (20 minutes) in 32 of the 48 months analyzed, while the maximum time of arrival (20 minutes) was

exceeded in all months in the range from 22,66% to 37,79% of the analyzed trips. In addition, the indicators of the number of EMS per 100000 inhabitants, the number of teams per 100000 inhabitants in relation to the population density per 1 km², and the number of trips per 1000 inhabitants referring to OA 14-04 show a difference in relation to individual counties (constituting OA 14-04), voivodships and Poland. In order to eliminate these disproportions and improve the time of arrival at the scene of the incident, OA 14-04 should have a minimum of three more EMS's.

Conclusion

The results of the research make it possible to verify and discover the factors determining the functioning of emergency medical service teams. Thus, these tests may affect the more effective operation of the State Emergency Medical System.

In the analyzed period (2015-2018), OA 14-04 recorded a yearly increase in EMS interventions. Call areas (urban, rural) are factors that have a significant impact on the interventions of the EMS. Diagnoses based on symptoms and disease features predominate among the diagnoses made by EMS, and the most common diagnosis is *R55-Syncope and collapse* (7,67%). The statutory standards of the arrival times of the EMS in OA 14-04 to the place of the call show numerous exceedances. For the proper functioning of the EMS system in OA 14-04, the amount of EMS is insufficient.

It is reasonable to conduct further research on the organization of the system and tasks carried out by EMS, which will significantly affect the setting of directions for improving the quality of health care services, such as medical rescue.