Reasons for medical rescue team interventions in the northwest part of masovian voivodeship

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Keywords

Emergency Medical Services, Prehospital Emergency Care, National Medical Rescue System, Emergency Medical Services Team

Abstract

Introduction: Civilisation development and huge technological progress influence the life and functioning of every human being. They facilitate functioning in the modern world but are also associated with increased incidence of trauma and morbidity, which are a challenge for modern health care systems. One of the main elements of health care is Emergency Medical Services System, whose aim is to save people who are in the state of sudden health hazard.

Aim: The aim of this paper was to analyse the reasons for medical rescue team interventions in the northwest part of Masovian voivodeship within the period of four years (2013-2016).

Materials and method: The analysis showed that the most common reason for medical rescue team intervention in the studied region and time period was cardiovascular diseases.

Results: Men and people aged 75-89 were the main beneficiaries of medical services provided by medical rescue teams. Cardiovascular diseases were more often diagnosed in women and people aged 75-89, while injuries were mainly diagnosed in men and people aged 45-59.

Conclusion: The gender and age of the patient, year, day of the week, the place of the call, team type and the urgency code of the call were important factors influencing the reasons for the intervention of MRTs in the analysed region and period.

Introduction

Current world statistics show that mortality resulting from various causes is a huge problem and a challenge for modern health care systems in the world. According to World Health Organisation (WHO) in 2016 there were 56.9 million deaths worldwide, of which ischemic heart disease and stroke were responsible for 15.2 million deaths and are called the world's top killers [1,2].

Ensuring the health security of the society by guaranteeing access to medical services for citizens is the basic and most important task of the administrative and governmental authorities of each country. One of the elements of the state's health care is the Emergency Medical Services System, which main purpose is to provide timely medical assistance to a person whose life and health is at risk [3,4].

The National Emergency Medical Services System was established in Poland under the Act of the National Emergency Medical Services of September 8, 2006 with its main purpose to save each person in the state of sudden health hazard. The National Emergency Medical Services System consists of two elements: Hospital Emergency Departments and medical rescue teams (MRT), including Helicopter Emergency Medical Service (HEMS) teams. Providing first aid in pre-hospital conditions is the responsibility of medical rescue

teams, whose main task is to perform medial rescue procedures at the scene and transport the patients to hospital [5,6,7].

The aim of this paper was to analyse the reasons for medical rescue team interventions in the northwest part of Masovian voivodeship.

Material and method

The study was conducted on the basis of the analysis of specialist and basic medical rescue team documentation - Emergency Rescue Card Orders and Medical Rescue Procedure Cards within the period of January 1, 2013 to December 31, 2016. The subject of the study were interventions performed by specialist and basic medical rescue teams in the northwest part of Masovian voivodeship (Mława District, Sierpc District, Przasnysz District and Żuromin District). Final analysis included the documentation of 63208 interventions of medical rescue teams.

Statistical analysis of the obtained results was performed by means of STATISTICA version 12 (StatSoft Polska). Sample size (N) and percentage (%) were used to describe qualitative data. Chi-squared test was used to assess the significant differences between the analysed qualitative variables. The value of $p<0.05$ was statistically significant.

Study results

In the presented paper men (53.40%) and people aged 75-89 (24.65%) were most often the patients of medical rescue teams. The most common reason for medical rescue team intervention was cardiovascular diseases constituting over the third of all interventions, while body injuries were the second most frequent reason and made one fifth of all interventions of medical rescue teams in Mława District, Sierpc District, Przysnysz District and Żuromin District in Masovian voivodeship (Table 1).

Table 1. Characteristics of the studied group of patients

Gender - n (%)	
Female	27601 (46.60)
Male	31633 (53.40)
Age - n (%)	
< 18 years old	3591 (5.90)
18-29 years old	5911 (9.72)
30 – 44 years old	8879 (14.59)
45 – 59 years old	11572 (19.02)
60 – 74 years old	13404 (22.03)
75 – 89 years old	14998 (24.65)
90 and older	2484 (4.08)
Main reason for calling - n (%)	
Cardiovascular diseases	13246 (36.07)
Body injuries	7446 (20.28)
Digestive system diseases	4374 (11.91)
Respiratory system diseases	4139 (11.27)
Nervous system diseases	3813 (10.38)
Mental disorders	3702 (10.08)

Medical rescue team interventions in northwest part of Masovian voivodeship in the period between 2013 and 2016 were analysed. Most of the interventions (16985) took place in 2016 (26.87%), and the least number of interventions (14371) took place in 2013 (22.74%). MRT interventions most often were performed on Saturdays (14.95%) and Sundays (14.96%) and least often on Tuesdays (13.51%) and the medical rescue teams were most often dispatched in rural areas (54.48%). More than a half of the interventions in the analysed region were performed by basic medical rescue teams (53.01%) and the vast majority of them were assigned with urgency code 2 (64.11%) (Table 2).

Table 2. Characteristics of medical rescue team interventions

Age - n (%)	
2013	14371 (22.74)
2014	16127 (25.51)
2015	15725 (24.88)
2016	16985 (26.87)
Day of the week - n (%)	
Monday	9330 (14.76)
Tuesday	8541 (13.51)
Wednesday	8719 (13.79)
Thursday	8787 (13.90)
Friday	8924 (14.12)
Saturday	9451 (14.95)
Sunday	9456 (14.96)
Place of call	
City	28774 (45.52)
Village	34434 (54.48)
Type of medical rescue team - n (%)	
Basic	33504 (53.01)
Specialist	29704 (46.99)
Urgency code for MRT dispatch - n (%)	
Code 1	21755 (34.42)
Code 2	40524 (64.11)
Other	929 (1.47)

Code 1 (K1) - requiring immediate dispatch of MTR with the arrival at the scene within the shortest possible time;
Code 2 (K2) - requiring dispatch of an available MRT;
Other - MRT dispatches with the assigned code 3 functioning before the entering into force of the Minister of Health Regulation of January 10, 2004 on the procedures of receiving calls by medical dispatches and dispatching medical rescue teams.

Statistical analysis showed statistically significant correlation between the most frequent diagnoses and gender and age of the patients ($p < 0.05$). Digestive system diseases were diagnosed more often in women (55.77%) and persons aged 75-89 (37.94%). While body injuries were diagnosed mainly in men (62.02%) and people aged 45-59 (19.38%). Respiratory system diseases were mainly diagnosed in men (54.20%) and patients aged between 75 and 89 years of age (34.68%). Digestive system diseases were diagnosed more often in women (54.24%) and persons aged 75-89 (27.73%). Nervous system diseases were

diagnosed more often in men (61.58%) and patients aged 30-44 (27.39%). Mental disorders were diagnosed more often in men (10.16%) and people aged 30-44 (28.26%). The results are presented in Table 3.

Table 3. The analysis of correlations between the most frequent diagnoses according to ICD-10 classification and gender and age of the patients

Variables	Most common diagnoses						Statistical analysis
	Cardiovascular diseases	Body injuries	Respiratory system diseases	Digestive system diseases	Nervous system diseases	Mental disorders	
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	
Gender							χ^2=799,2433 df=5 p=0,0000
Female	7086 (55.77)	2697 (37.98)	1820. (45.80)	2272 (54.24)	1410 (38.42)	1729 (48.42)	
Male	5620 (44.23)	4404 (62.02)	2154 (54.20)	1917 (45.76)	2260 (61.58)	1842 (51.58)	
Age of the patient							χ^2=8111,120 df=30 p=0,0000
< 18 years old	143 (1.08)	823 (11.16)	350 (8.46)	284 (6.50)	296 (7.80)	139 (3.78)	
18 – 29 years old	304 (2.30)	1295 (17.57)	84 (2.03)	403 (9.22)	486 (12.81)	592 (16.10)	
30 – 44 years old	801 (6.07)	1317 (17.86)	157 (3.80)	600 (13.73)	1039 (27.39)	1039. (28.26)	
45 – 59 years old	2151 (16.30)	1429 (19.38)	502 (12.14)	773. (17.69)	873 (23.01)	928 (25.24)	
60 – 74 years old	3998 (30.29)	1113 (15.10)	1394 (33.71)	847 (19.38)	584 (15.39)	525 (14.28)	
75 – 89 years old	5008 (37.94)	1123 (15.23)	1434 (34.68)	1212 (27.73)	473 (12.47)	410 (11.15)	
90 and older	794 (6.02)	272 (3.69)	214 (5.18)	251 (5.74)	43 (1.13)	44 (1.20)	

Statistical analysis also showed a statistically significant relation between the most common reasons for medical rescue team interventions and the day and year of the intervention in Mława District, Sierpc District, Przasnysz District and Żuromin District in Masovian voivodeship (p<0.05). Cardiovascular diseases were diagnosed more often in 2016 (27.00%) and on Mondays (15.24%). Body injuries were mainly diagnosed in 2014 (27.21%)

and on Saturdays (16.44%). Cardiovascular diseases were diagnosed more often in 2014 and on Mondays (15.49%). Digestive system diseases dominated in 2016 (28.60%) on Tuesdays and Wednesdays (14.68%). Cardiovascular diseases were diagnosed more often in 2016 (28.87%) and on Mondays (14.66%). Mental disorders were mainly diagnosed in 2016 (26.23%) and on Mondays (15.48%) in the analysed region (Table 4).

Table 4. The analysis of the correlations between the most frequent diagnoses according to ICD-10 classification and the year and day of the week of the medical rescue team intervention in north west part of Masovian voivodeship.

Variables	Most common diagnosis						Statistical analysis
	Cardiovascular diseases	Body injuries	Respiratory system diseases	Digestive system diseases	Nervous system diseases	Mental disorders	
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	
Year							χ^2=53,4663 df=15 p=0,0000
2013	3017 (22.78)	1650 (22.16)	931 (22.49)	900 (20.58)	843 (22.11)	912 (24.64)	
2014	3343 (25.24)	1923 (25.83)	1111 (26.84)	1134 (25.93)	958 (25.12)	909 (24.55)	
2015.	3310 (24.99)	1847 (24.81)	1108 (26.77)	1089 (24.90)	911 (23.89)	910 (24.58)	
2016	3576 (27.00)	2026 (27.21)	989 (23.89)	1251 (28.60)	1101 (28.87)	971 (26.23)	
Day of the week							χ^2=62,9107 df=30 p=0,0004
Monday	2019 (15.24)	1074 (14.42)	641 (15.49)	635 (14.52)	544 (14.27)	573 (15.48)	
Tuesday	1786 (13.48)	942 (12.65)	564 (1363)	642 (14.68)	559 (14.66)	504 (13.61)	
Wednesday	1827 (13.79)	972 (13.05)	568 (13.72)	642 (14.68)	521 (13.66)	515 (13.91)	
Thursday	1810 (13.66)	1060 (14.24)	588 (14.21)	636 (14.54)	556 (14.58)	556 (15.02)	
Friday	1870 (14.12)	1097 (14.73)	535 (12.93)	609 (13.92)	554 (14.53)	479 (12.94)	
Saturday	1926 (14.54)	1224 (16.44)	624 (15.08)	604 (13.81)	527 (13.82)	531 (14.34)	
Sunday	2008 (15.16)	1077 (14.46)	619 (14.96)	606 (13.85)	552 (14.48)	544 (14.69)	

Statistical analysis showed that cardiovascular diseases were diagnosed more often by specialist medical rescue teams (53.73%) and when the call was assigned with code 2 - necessary dispatch of an available MRT (67.71%). Body injuries were diagnosed mainly by basic medical rescue teams (62.75%) and the assigned urgency code was code 2 (68.52%). While to patients who had problems with the digestive system basic medical rescue teams were dispatched more often (60.65%) and in cases when the assigned code was code 2 (78.49%). Basic medical rescue teams were mostly dispatched to patients with nervous system diseases (55.05%) and the assigned code was code 2 (52.71%). Specialist medical rescue teams were more frequently dispatched to patients with mental disorders (52.05%), and the assigned urgency code to these calls was code 2 - necessary dispatch of an available MRT (73.45%). The observed differences were statistically significant (p<0.05) (Table 3).

Table 5. The analysis of the correlations between the most frequent diagnoses according to ICD-10 classification and the place of call, type of the medical rescue team and urgency code of medical rescue team intervention in north west part of Masovian voivodeship.

Variables	Most common diagnosis						Statistical analysis
	Cardiovascular diseases	Body injuries	Respiratory system diseases	Digestive system diseases	Nervous system diseases	Mental disorders	
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	
Place of call							
Village	7496 (56.59)	3944 (52.97)	2359 (56.99)	2408 (55.05)	2092 (54.86)	1909 (51.57)	χ^2=50,2703 df=5 p=0,0000
City	5750 (43.41)	3502 (47.03)	1780 (43.01)	1966 (44.95)	1721 (45.14)	1793 (48.43)	
Type of medical rescue team							
Basic	6127 (46.75)	4672 (62.75)	1746 (42.18)	2653. (60.65)	2099. (55.05)	1775. (47.95)	χ^2=848,9897 df=5 p=0,0000
Specialist medical rescue team	7119 (53.74)	2774 (37.25)	2393 (57.82)	1721 (39.35)	1714 (44.95)	1927 (52.05)	
Urgency code							
Code 1	4156 (31.38)	2240 (30.08)	1377 (33.27)	865 (19.78)	1756 (46.05)	936 (25.28)	χ^2=751,4008 df=10 p=0,0000
Code 2	8969 (67.71)	5102 (68.52)	2715 (65.60)	3433 (78.49)	2010 (52.71)	2719 (73.45)	
Other	121 (0.91)	104 (1.40)	47 (1.14)	76 (1.74)	47 (1.23)	47 (1.27)	

Discussion

Civilisation development and huge technological progress influence the life and functioning of every human being. On the one hand they facilitate functioning in the modern world and improve the quality of life, on the other hand they are also associated with increased incidence of trauma and morbidity, which are a challenge for modern health care systems. One of the main elements of health care is Emergency Medical Services System, whose aim is to save people who are in the state of sudden health hazard. In Poland it is the responsibility of the National Medical Emergency Services System, whose main goals, the organisational structure and functioning are described in the Act of the National Emergency Medical Services of September 8, 2006 [7,8,9,10,11].

Various factors influencing the intensity of medical rescue team interventions have been presented in scientific papers published in Poland and in the world [8,12,13,14]. The analysis of the frequency of medical rescue team interventions in the authors' own study indicated that the interventions were most frequent on Saturdays and Sundays. By contrast, Møller et al. (2015) in their analysis of emergency calls in Copenhagen showed that the most numerous calls were made on Saturdays and Sundays and during the day [12].

Goldstein et al. (2015), Rzońca et al. (2017) and Aftyka and Rudnicka-Drożdżak (2013) in their studies regarding the analysis of medical rescue team interventions found that MRT dispatches were more frequent in urban areas [13,15,16]. While the analysis of the authors' own study showed that the majority of medical rescue team interventions were performed in rural areas.

The functioning of basic and specialist medical rescue teams with special emphasis on the frequency and reasons for MRT dispatch and urgency code have been presented in various scientific papers [8,15,17,18,19]. The study conducted by Guła et al. (2014) indicated that the vast majority of all interventions were performed by basic medical rescue teams and the assigned urgency code was code 2 - necessary dispatch of an available MRT [18]. Similar results were obtained by Aftyka and Rudnicka-Drożdżak (2013) [15]. The results of the study conducted by Sowizdraniuk et al. (2014), Gawełko and Wilk (2015) and Filip et al. (2016) emphasised that basic medical rescue teams were dispatched more frequently [8,18,19]. The presented results were also confirmed by the authors' own study, where more than a half of all interventions was performed by basic medical rescue teams. The analysis of the code of MRT

dispatch showed that the most frequently assigned code was code 2 - necessary dispatch of an available medical rescue team.

The authors' own study showed that medical rescue teams were dispatched more often to men and patients aged 60-74 and 75-89. The analysis of medical rescue team dispatches in the USA conducted by Baker and McKay (2010) showed that the average age of the patients was 41.2 and that they were mostly men. Similar results were obtained in the analysis of MRT dispatches in the northern part of Denmark conducted by Christensen et al. (2017), which reported that the average age of the patients was above 50 and men were significantly more often managed by medical rescue teams [21]. Also the study conducted by Filip et al. (2016) showed that men and patients over 70 were the main patient group managed by MRTs [8]. The analysis of the literature showed that men and older people more often are the beneficiaries of medical services provided by Emergency Medical Service teams globally, what has been confirmed by Blanchard et al. (2012), Andruszkow et al. (2014) and Villani et al. (2017) [22, 23,24].

The results of the authors' own study showed that medical rescue teams in the analysed region of Masovian voivodeship were most frequently dispatched to patients suffering from cardiovascular diseases, thus remaining closely related with the tendencies of causes of death observed in the world, in Europe and Poland.

Gawełko and Wilk (2015) in their study concerning the analysis of calls received by the Regional Ambulance Station in Rzeszów showed that the main reason for dispatching medical rescue teams according to ICD-10 classification were symptoms, signs and abnormal results of clinical and laboratory findings, followed by injuries, poisoning, as well as other specific effects of external factors, further diagnosis of cardiovascular diseases, and finally nervous system diseases [17]. Study conducted by Christensen et al. (2017) concerning the analysis of diagnostic patterns and mortality of patients of ambulance service in the region of northern Denmark in the years 2007-2014 showed that the leading diagnosis made by MRTs in the years 2007-2013 were injuries, poisoning, and other specific effects of external factors, which were gradually decreasing. While in 2014 most common were symptoms, signs and abnormal test results. [21]. It should be emphasised that precise estimation of the number of patients to which medical rescue teams were dispatched due to cardiovascular diseases is very difficult. This is due to the fact that the diagnoses made in the course of pre-hospital care are often not detailed enough and coded according to ICD-10 classification as general symptoms

and signs or symptoms and signs connected with cardiovascular diseases and respiratory system diseases, what was also emphasised by Aftyka and Rudnicka-Drożdżak (2013) in their analysis of reasons for calls to the Regional Ambulance Service in Lublin [15]. Study conducted by Guła et al. (2014) concerning the analysis of MRT interventions found that they were mainly dispatched to acute coronary syndrome and transport accidents [18]. While Aftyka and Rudnicka-Drożdżak (2013) reported that injuries and cardiovascular diseases were the leading reason for dispatching MRTs of the Regional Ambulance Station in Lublin [15].

The problem of rapid development of chronic diseases, in particular cardiovascular diseases is a great challenge for the modern world [25.26]. The number of deaths caused by cardiovascular diseases is increasing globally and is a challenge mainly for healthcare providers, which is also confirmed the authors' own study [27,29].

The analysis of the results of the authors' own study indicated that MRTs were more often dispatched to patient with cardiovascular diseases aged 75-89. It should be emphasised that a significant increase in interventions was observed in patients who were over 60. The analysis of medical rescue team interventions connected with cardiology problems carried out by Urbaniak-Ostrykiewicz et al. (2017) showed that the majority of such diagnoses concerned patients over 61 years of age [30].

One of the main research issues regarding injuries is the analysis of various mechanisms of injuries, factors determining injuries or actions of emergency services in the case of injuries, which were presented in the studies of Bigdeli et al. (2010), Fazel et al. (2012), Huang et al. (2016)[31, 32,33]. The study carried out by Mamada et al. (2012) regarding the analysis of mortality due to body injuries in Guinea reported that casualties are more often men and people aged between 25 and 64 [34]. By contrast, Fazel et al. (2012) in the analysis of the profile of adults suffering from injuries in the years 2007-2011 in Iran found that body injuries occur more often in men, people with an average age of 33.18 (±10.90), in urban areas, on city streets as a result of transport accidents [32]. Huang et al. (2016) characterized patients who suffered in a transport accident and were transported in an ambulance. In their study they found that men and people with an average age of 50-59 [33] were more often the casualties transported by ambulances. While Rzońca et al. (2017) in their study regarding body injuries in patients hit by a vehicle and managed by Helicopter Emergency Medical Service teams in Poland showed that casualties were mostly men, people under 44 years of age, who were diagnosed with multiple organ injuries [35]. The results of

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the authors' own analysis showed, similarly to the analyses presented above, that the patients with body injuries were most often men, people aged 45-59, the place of call was rural area, and the call was assigned with urgency code 2 - necessary dispatch of an available MRT.

Conclusion

The gender and age of the patient, year, day of the week, the place of the call, the type of team and the urgency code of the call were important factors influencing the reasons for the intervention of MRTs in the analysed region and period.

Pre-hospital care provided by medical rescue teams is an essential element of efficient health care in the case of patients in the state of sudden health hazard. It is necessary to provide a well-qualified staff, implement new technological, organisational and medical solutions, in order to guarantee the development of Emergency Medical Services and the activities of medical rescue teams [8,36,37].

Conflicts of interest

The authors declared no potential conflicts of interest.

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