ORIGINAL ARTICLE

Analysis of out-of-hospital cardiac arrest in Poland in a 1-year period: data from the POL-OHCA registry

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KEY WORDS
emergency medical team, out-of-hospital cardiac arrest, resuscitation, return of spontaneous circulation, sudden cardiac death

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ABSTRACT

BACKGROUND Out-of-hospital cardiac arrest (OHCA) is a severe medical condition. Prehospital care plays an essential role in patient survival.

AIMS First, the study aimed to evaluate cases of OHCA managed by cardiopulmonary resuscitation (CPR) attempts in Poland in 2018, including their frequency and patient outcomes in terms of survival until hospital admission or transport to the hospital by helicopter emergency medical service (HEMS). Second, the study was performed to identify the predictors of patient survival until hospital admission or transport by HEMS.

METHODS It was a case-control study based on medical records. In 2018, 3 400 000 emergency visits were registered. Patients who were treated by emergency medical service (EMS) ambulance staff using defibrillation and / or administering at least 1 dose of 1 mg of epinephrine were considered to have OHCA managed by CPR attempts.

RESULTS A total of 26 783 CPR attempts were reported by EMS in Poland in 2018. The incidence of OHCA with CPR attempts in 2018 was 69.7 per 100 000 inhabitants and it varied from 58.9 per 100 000 to 84.5 per 100 000 inhabitants in 16 Polish provinces. The mean survival rate until hospital admission or transport by HEMS was 36.3% and it ranged from 34.5% to 38.3%. Patient survival until hospital admission or transport by HEMS was related to age, sex, emergency site, defibrillation during CPR, the first recorded rhythm, and procedures performed by the EMS personnel.

CONCLUSIONS The rate of OHCA with CPR attempts was similar to that reported in other European countries. Patient survival until hospital admission or transport by HEMS was associated with many well-known, identified nonmodifiable and modifiable factors.

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INTRODUCTION Out-of-hospital cardiac arrest (OHCA) poses a significant medical and social problem, being the most relevant cause of overall mortality[1] and the leading cause of death in Europe and the United States. Depending on how OHCA is defined, the condition is diagnosed in Europe with an incidence of 38 per 100 000 inhabitants annually,[2-4] whereas in the United States, with an incidence of 76 per 100 000 inhabitants annually.[5]

Out-of-hospital cardiac arrest is a traumatic experience for both the patient and those who witness the event.[6] In most cases, OHCA is considered to be of cardiac origin, mainly due to acute coronary syndromes. However, about 15% of the cases may occur due to noncardiac causes such as, among others, trauma, drowning, overdose, asphyxia, electrocution, and primary respiratory arrests.[7] The exact burden of OHCA on

WHAT'S NEW?

So far, only regional data regarding out-of-hospital cardiac arrest (OHCA) in Poland have been made available. This paper presents data concerning OHCA managed by cardiopulmonary resuscitation attempts in the entire country in 2018, as well as analyzes differences in its incidence among provinces and annual variability. Contrary to what was expected, interventions with priority code C-2 were associated with better patient survival. In those cases, OHCA probably occurred after emergency medical service had been called. This indicates the necessity to perform further analyses to identify factors related to the occurrence of OHCA after an emergency call. The presented data come from the newly developed Command Support System, which may facilitate scientific analysis in the field of emergency medicine.

public health is unknown.[6,7] Regional systems of care for OHCA differ, and their characteristics may have an impact on the overall prognosis, which otherwise is relatively poor. In order to improve the outcomes of patients with OHCA, a "formula for survival" was determined.[8] Local implementation was its third element, apart from medical science and educational efficiency.

Continuous evaluation of care quality and treatment outcomes is the key issue to improve patient prognosis. In recent years, Poland has undergone substantial changes in healthcare, including prehospital care. The introduction of the Act on National Emergency Medical Services[9] was a breakthrough. It defined the principles of functioning of prehospital care and hospital emergency departments. A medical dispatcher, who is the first person to come in contact with a caller and activates the entire emergency medical system, plays a crucial role in the prehospital system. In 2019, the Polish Ministry of Health issued a regulation on the collection of patient history by medical dispatchers.[10] The effectiveness of the introduced changes should be assessed. Performing research and publishing the findings are important measures taken in order to look for gaps in patient care and identify delays in the implementation of guidelines in clinical practice. Management pathways should be assessed and analyzed to create new primary and secondary prevention strategies. Many OHCA registries were established worldwide and can be analyzed.[11,12]

The first aim of this study was to evaluate cases of OHCA managed by cardiopulmonary resuscitation (CPR) in Poland in 2018, that is, their frequency and associated patient outcomes in terms of survival until hospital admission or transport to the hospital by helicopter emergency medical service (HEMS). The second aim was to define the predictors of survival until hospital admission or transport to the hospital by HEMS after OHCA with CPR attempts.

PATIENTS AND METHODS

Study design and participation It was a case-control study based on the medical records of the Polish Command Support System (CSS), a new centralized database tool constituted by the Regulation of the Ministry of Health. In 2018, 3 400 000 emergency visits were reported. Our study group included 26 783 patients with OHCA, treated between January 1, 2018 and December 31, 2018 by emergency medical service (EMS) ambulance staff using defibrillation or administering at least 1 dose of 1 mg of epinephrine. For this retrospective analysis, neither ethics committee approval nor patient consent were required.

Characteristics of the National Emergency Medical Service in Poland The Polish EMS consists of 3 closely cooperating units: 1) dispatch centers, where a paramedic or a nurse, who can contact a physician, receives and manages urgent calls made using the dedicated phone number 999 or receives calls from the Emergency Center, performed using the emergency phone number 112; 2) ambulances staffed with a paramedic or a nurse and an ambulance driver–paramedic, or a physician, a nurse or a paramedic, and an ambulance driver–paramedic; and 3) emergency departments.

Dispatchers assign a priority code to each accepted emergency call: C-1 means the highest, and C-2, the second highest priority (code C-1 requires an ambulance to leave with emergency lights and a siren on within 60 seconds after receiving the notification about the departure; code C-2 requires an ambulance to leave within 120 seconds after the notification).

Each ambulance has a unique number, which consists of 1 letter indicating the province of its operation and a number assigned in a given province territory.

Data collection and processing In Poland, a statutorily mandated form is filled in by the EMS personnel and dispatchers in the case of accepted emergency calls—an ambulance call report. Access to these data was granted by the Polish Ministry of Health in cooperation with the National Center for Monitoring Emergency Medicine (operating the POL-OHCA registry) at the request of the National Consultant in Emergency Medicine.

The National Center for Monitoring Emergency Medicine stores records of emergency ambulance visits as part of CSS. Details regarding each ambulance dispatch can be found there: time, ambulance number, reason for dispatch, diagnosis made by the ambulance staff, medications used, procedures performed, and information on whether the patient remained at home, was referred to the hospital, or transported to the hospital by HEMS. Based on these data, we could not determine whether patients received CPR or had been resuscitated at the time of their transfer to another unit.

Two dispatches to 2 patients of the same age and sex, sent to the same site within less than

an hour, were regarded as a dispatch to the same patient. Very often, the second dispatch was described as aimed to help the personnel of an ambulance dispatched earlier.

The original form for reporting sudden cardiac death, published in 1991 as the Utstein template, was again discussed by a group of specialists from leading emergency medicine societies, including the European Resuscitation Council, and 29 key elements were selected to be included in the description of such an event. A form for collecting data on cardiac arrest was also proposed.

The data collected using forms proposed by Jacobs et al,[13] stored in the CSS, and obtained from the CSS to perform this study are summarized in TABLE 1.

Definitions of study endpoints Cardiopulmonary resuscitation attempts were defined as administration of defibrillation or at least 1 dose of 1 mg of epinephrine to a patient diagnosed with 1 of the above codes.

The CSS records contained no information on whether the patient who remained at home was alive or dead. Therefore, we assumed that the patient after CPR who remained at home had died, and the patient who was passed to HEMS or referred to the hospital was alive. In the case of 2 ambulances dispatched to the same patient, it frequently happened that 1 team reported that the patient had remained at home, and the second team stated that the patient had been taken to the hospital. These records were interpreted as follows: 1 ambulance left the patient at home, and the other one transferred the patient to the hospital. Based on the records, it could not be determined whether the return of spontaneous circulation was achieved at the scene.

Statistical analysis Continuous variables were expressed as mean (SD) and compared using the *t* test. Discrete variables were presented as numbers and percentages and compared using the χ^2 test.

Stepwise logistic regression analysis was performed to investigate an association between survival until hospital admission or HEMS transportation, demographics, and relevant

TABLE 1 Patient characteristics recommended to be included in the Utstein template and the data collected in the Command Support System

Utstein template	Data available in the CSS
Patient's identifier	Yes
Age	Yes
Cardiac arrest determined	No
Cause of cardiac arrest	Sometimes available, data were not systematically collected by rescuers
Treatment before EMS arrival, CPR attempts by EMS	Sometimes available, data were not systematically collected by rescuers
Defibrillation with AED, ICD	Sometimes available, data were not systematically collected by rescuers
Cardiac arrest location (in-hospital or out-of-hospital)	Only out-of-hospital
Witnessed (if witnessed, provide time of cardiac arrest)	Sometimes available, data were not systematically collected by rescuers
Initial rhythm	Yes
Chest compressions	Yes
Defibrillation attempts	Yes
Time of collapse	Sometimes available, data were not systematically collected by rescuers
Time of call receipt	Yes
Time of vehicle stopped	Yes
Time of first rhythm analysis	No
Spontaneous circulation on arrival to ED	No
Hospital admission	Yes or HEMS transportation
Hospital discharge (date of hospital discharge or death, CPC)	No

Abbreviations: AED, automated external defibrillator; CPC, cerebral performance category; CPR, cardiopulmonary resuscitation; CSS, Command Support System; ED, emergency department; EMS, emergency medical service; HEMS, helicopter emergency medical service; ICD, implantable cardioverter-defibrillator

clinical characteristics. A *P* value less than 0.05 was considered significant.

RESULTS In 2018, a total of 26 783 CPR attempts were reported by EMS in Poland. The incidence of OHCA managed by CPR attempts in 2018 was 69.7 per 100 000 inhabitants. The OHCA incidence ranged from 58.9 per 100 000 inhabitants to 84.5 per 100 000 inhabitants in 16 Polish provinces (TABLE 2).

The monthly distribution of cases of OHCA with CPR attempts is presented in TABLE 2. The mean rate of survival until hospital admission or

TABLE 2 Incidence of out-of-hospital cardiac arrest managed by cardiopulmonary resuscitation attempts in 16 Polish provinces

Province	Area, km²	Total population, n	Population, persons/km²	CPR attempts, n	CPR attempts per 100 000 inhabitants, n	Survival to hospital admission or HEMS referral, n (%)
Lower Silesia	19 947	2 901 225	145	2197	75.7	706 (32.1)
Kujawy-Pomerania	17 971	2 077 775	116	1512	72.8	616 (40.7)
Lublin	25 123	2 117 619	84	1357	64.1	543 (40)
Lubuskie	13 988	1 014 548	73	697	68.7	302 (43.3)
Łódz	18 219	2 466 322	135	2153	87.3	937 (43.5)
Małopolska	15 183	3 400 577	224	2437	71.7	926 (38)
Mazovia	35 559	5 403 412	152	3312	61.3	1222 (36.9)
Opole	9412	986 506	105	661	67	236 (35.7)
Podkarpacie	17 846	2 129 015	119	1333	62.6	458 (34.4)
Podlasie	20 187	1 181 533	59	788	66.7	275 (34.9)
Pomerania	18 323	2 333 523	127	1546	66.3	531 (34.4)
Silesia	12 333	4 533 565	368	3420	75.4	921 (26.9)
Świętokrzyskie	11 710	1 241 546	106	1012	81.5	392 (38.7)
Warmia-Masuria	24 173	1 428 983	59	842	58.9	394 (46.8)
Wielkopolska	29 826	3 493 969	117	2228	63.8	803 (36)
West Pomerania	22 905	1 701 030	74	1288	75.7	471 (36.6)

Abbreviations: see TABLE 1

TABLE 3 Monthly distribution of out-of-hospital cardiac arrest managed by cardiopulmonary resuscitation attempts

Month	Patients with OHCA, n	Survival to hospital admission or HEMS referral
January	2363 (8.8)	850 (36)
February	2291 (8.6)	805 (35.1)
March	2662 (9.9)	968 (36.4)
April	2159 (8.1)	791 (36.6)
May	2110 (7.9)	809 (38.3)
June	1999 (7.5)	763 (38.2)
July	2087 (7.8)	771 (36.9)
August	1990 (7.4)	735 (36.9)
September	2130 (8)	777 (36.5)
October	2319 (8.7)	828 (35.7)
November	2270 (8.5)	784 (34.5)
December	2403 (9)	852 (35.5)
In total	26 783 (100)	9733 (36.3)

Data are presented as number (percentage).

Abbreviations: OHCA, out-of-hospital cardiac arrest; see TABLE 1

transport by HEMS was 36.3% and varied from 34.5% to 38.3% among particular months (TABLE 3).

The number of CPR attempts was significantly higher in the areas with a population over 10 000, and the percentage of patients admitted to the hospital or transported by HEMS was substantially higher in these places than in those with a population below 10 000 (TABLE 4).

A total of 1698 ambulances were dispatched to treat patients with OHCA, and 30 788 ambulance visits were reported in those in whom CPR was attempted. A total of 26 783 patients with

TABLE 4 Cardiopulmonary resuscitation attempts and survival to hospital admission or helicopter emergency medical service referral in relation to emergency site population

Emergency site population, n	CPR attempts	Survival to hospital admission or HEMS referral
>10 000	14 721 (55)	5699 (38.7)
≤10 000	12 062 (45)	4034 (33.4)
P value	<0.001	<0.001

Data are presented as number (percentage).

Abbreviations: see TABLE 1

TABLE 5 Characteristics of patients with out-of-hospital cardiac arrest who received cardiopulmonary resuscitation and survived to hospital admission or helicopter emergency medical service referral or died at the scene

Variable	Survival to hospital admission or HEMS referral	Death at the scene	*P* value
Age, y, mean (SD)	64.6 (18)[a]	66.1 (17.3)[b]	<0.001
Male sex	4874 (67)	8821 (69.1)	0.002
Defibrillation	4079 (41.9)	4490 (26.3)	<0.001
Emergency site population >10 000	5699 (58.6)	9022 (52.9)	<0.001
Dispatch priority code 1	8157 (85.6)	15 286 (91.2)	<0.001
2 EMS ambulances dispatched	1788 (18.4)	2489 (14.6)	<0.001
Defibrillation performed by the first EMS team	4010 (41.2)	4392 (25.8)	<0.001
VF / VT reported by the first EMS team	2837 (29.5)	2633 (15.4)	<0.001
Sinus rhythm	2069 (21.3)	425 (2.5)	<0.001
Supraventricular tachycardia	316 (3.3)	59 (0.4)	<0.001
VT	175 (1.8)	53 (0.3)	<0.001
Atrial fibrillation	727 (7.5)	301 (1.8)	<0.001
Atrioventricular block	125 (1.3)	55 (0.3)	<0.001
Asystole	4571 (47)	13 577 (79.6)	<0.001
PEA	2872 (28.5)	3799 (22.3)	<0.001
Pacemaker's artifacts	268 (1.7)	348 (2)	0.069
ECG signs of myocardial infarction	646 (6.4)	205 (1.2)	<0.001
Pacing	184 (1.9)	282 (1.7)	0.15
Intubation	7761 (79.7)	12 980 (76.1)	<0.001
Venous access	9165 (94.2)	15 680 (92)	<0.001
Traumatic injuries	1279 (13.1)	1909 (11.2)	<0.001
Epinephrine	9549 (98.1)	16 768 (98.4)	0.15
Atropine	2066 (21.2)	3318 (19.8)	0.006

Data are presented as number (percentage) unless otherwise indicated.

a Data available for 8166 study patients
b Data available for 14 599 study patients

Abbreviations: ECG, electrocardiographic; PEA, pulseless electrical activity ; VF, ventricular fibrillation; VT, ventricular tachycardia; others, see TABLE 1

TABLE 6 Stepwise logistic regression analysis of the association between patient survival until hospital admission or helicopter emergency medical service transportation, demographics, and clinical characteristics

Variable	OR	95% CI	*P* value
VF / VT at the first ECG	1.73	1.57–1.9	<0.001
Defibrillation	1.29	1.18–1.41	<0.001
Atrioventricular block	3.16	2.21–4.52	<0.001
Atropine use	1.14	1.06–1.23	<0.001
Emergency site with more than 10 000 inhabitants	1.21	1.14–1.29	<0.001
Dispatch priority code C-2	1.8	1.65–1.97	<0.001
Male sex	0.87	0.8–0.91	<0.001
Epinephrine use	0.18	0.15–0.22	<0.001

Abbreviations: ECG, electrocardiogram; OR, odds ratio; others, see TABLE 5

OHCA in whom CPR was attempted were treated by the personnel of 1 ambulance, and 4005 by the personnel of 2 ambulances.

Patients with OHCA in whom CPR was attempted and who died at the scene were older, more frequently male, rarely defibrillated, and more often lived in areas with up to 10 000 residents. Additionally, ambulances were more often dispatched with priority code C-1 than C-2, and asystole was more often the first rhythm abnormality observed. Comparison between patients with OHCA in whom CPR was attempted and who survived until hospital admission or transport by HEMS and those who died at the scene is presented in TABLE 5.

Multivariate analysis Stepwise logistic regression analysis was performed and yielded the following results: ventricular fibrillation (VF) / ventricular tachycardia (VT) on the first electrocardiogram, defibrillation, atrioventricular block, atropine use, an emergency site with more than 10 000 inhabitants, and dispatch priority code C-2 were factors positively related to survival until hospital admission or HEMS transportation, whereas male sex and use of epinephrine were related negatively.

Age was not included into the analysis, as the model with age could not be established because of redundancy. Detailed results are summarized in TABLE 6.

DISCUSSION

Our study showed that the overall rate of patients with OHCA in whom resuscitation was performed by EMS, which was recorded in Poland in 2018, amounted to nearly 70 cases per 100 000 people. This is higher than, for example, in Denmark, Finland, and Sweden.[14-16] The rate of CPR attempted in patients with OHCA was estimated to be 56 per 100 000 persons per year in the EuReCa ONE (European Registry of Cardiac Arrest) study.[17] The rate for Poland, obtained from the region inhabited by 6% of the Polish population, was 70 cases per 100 000 inhabitants, which is in line with our results.

The incidence of CPR attempts in Poland is higher than in many European countries, which may be related to higher incidence of OHCA or an increased percentage of CPR attempts performed. Moreover, the method of calculating cases of OHCA may have an impact on the results. In a study by Chęciński et al,[18] reports filled in by the ambulance personnel were analyzed in terms of OHCA and the rate of cases in which CPR was attempted was 43.2 per 100 000 people per year. Gach et al[19] counted the dispatched EMS ambulances and reported the rate of CPR attempts of 95 per 100 000 people.[19] In the case of dispatching 2 ambulances to the same patient, their method of determining the number of cases of OHCA could result in overestimating the number of patients. The differences in the prevalence of OHCA in various regions and countries may depend on the model of care for patients with chronic diseases at the end of their lives.

Providing less institutional care results in a lower percentage of cases of OHCA. Of note, OHCA is defined as a loss of mechanical heart activity in a patient outside the hospital. The definition is met in all cases of out-of-hospital death. Due to the fact that the purpose of resuscitation is to prevent death, we believe that when death is an end-of-life event, its prevention would be not only futile but also unethical.[20] The percentage of such OHCAs and ambulance calls made to help patients at the end of life may vary from one country to another. Undertaking resuscitation in such patients may also be different. Therefore, despite establishing registries of the occurrence of OHCA in patients resuscitated by EMS, their number may differ among countries, even if the medical problems are similar. Fewer divergences may be observed in the annual variability of the occurrence of OHCA.[21]

Another method of presenting OHCA-related problems is focusing only on sudden OHCA of presumed cardiac etiology. It seems to be the most accurate way to determine the number of treatable OHCA of cardiac origin, which constitutes about 85% of nontraumatic sudden cardiac arrests. However, it is still challenging to implement it in the daily duties of ambulance teams, as it requires collecting detailed medical history and recording it, which is considered time-consuming by the busy and tired EMS personnel.

Apart from that, we demonstrated that the percentage of patients in whom CPR was attempted, with VF as the first recorded rhythm, was 20.4%. The EuReCa ONE registry reported this proportion to be 22%.[17] The incidence

of VF/VT depends on the characteristics of the studied population. The frequency of VF as the first recorded rhythm decreased in the last decade.[22] This finding concerns the increasing use of implantable cardioverter-defibrillators (ICDs) and availability of myocardial revascularization procedures. However, it cannot be ruled out that the increasing number of CPR attempts is related to those performed in patients in whom CPR was earlier regarded as futile. The negative correlation between the frequency of CPR attempts and the incidence of VF/VT may confirm such an assumption. In a small study performed in a region of Poland in the years 2004 to 2005, there were 43 CPR attempts per 100 000 persons per year, and the occurrence of VF/VT was equal to 48%.[18] In another study conducted in the Bielsko-Biała region in Poland in 2003, the rate of CPR attempts was 125 per 100 000 persons per year, and the proportion of VF/VT was 39%.[19]

The third finding of our study was that the overall survival until hospital admission or transport by HEMS was 27.6%. This is in line with results of other studies. Patient survival until hospital admission depends on the frequency of CPR performed by bystanders, presence of a shockable rhythm, localization of patients with cardiac arrest, and distance between an emergency site and an ambulance station. Analyzing the factors related to survival until hospital admission or transport by HEMS in the present study, it was demonstrated that up to 10% of patients with OHCA showed initial symptoms of cardiac arrest, which were not considered a direct threat to life, and an ambulance was dispatched with code C-2. The EMS ambulances were dispatched with code C-2 to patients in whom cardiac arrest was not identified and would occur after the emergency call. The immediate prehospital care for patients with OHCA may increase survival. Identifying this population and patients at an increased risk of OHCA could enable the implementation of early, rapid measures taken by bystanders and EMS.

Moreover, dispatchers could instruct bystanders and patients what to do prior to the EMS arrival, both in the case of a prearrest state or after the occurrence of cardiac arrest. Prearrest patients could be instructed to open the door or call the neighbors if they are alone at home. Furthermore, if myocardial infarction is suspected, taking aspirin is a first-aid measure and could be recommended by a dispatcher.[23] According to Karam et al,[24] young age, absence of obesity and diabetes mellitus, dyspnea, and a short period between the onset of pain and the emergency call were main predictors of sudden cardiac arrest in the population of patients with ST-segment elevation myocardial infarction (STEMI). The authors prepared a simple score that can optimize dispatching of ambulances and management of patients with STEMI by EMS. In that study, the incidence of OHCA in patients with STEMI was 5.6%. However, it included only those in whom cardiac arrest occurred after the arrival of EMS. Further efforts should be made to better identify imminent OHCA by dispatchers, using short and straightforward structured algorithms.

Given that young people with no relevant medical history are often victims of OHCA, patients need to be educated by family doctors, who encounter them in situations unrelated to urgent events, to call 112 or 999 if prodromal symptoms occur in the future. Finally, analyzing emergency calls from patients in whom cardiac arrest would occur before the arrival of EMS could help to identify predictors of OHCA after an emergency call, yet prior to the arrival of EMS.

Moreover, our study could facilitate efforts to improve the forms for reporting cases of OHCA by the EMS personnel. Additionally, despite the fact that there are no problems with death registration in Poland, its appropriate coding poses a considerable challenge. Systematic analyses of cases of OHCA may be helpful in research on the causes of death. To our knowledge, this is the first study to analyze such data collected during a 1-year period in the entire country.

Limitations Lack of information on the rate of returned spontaneous circulation at the scene was the first limitation of our study. Ongoing CPR during hospital admission was found in about 1% of patients included in the study.

Based on the CSS data, we could assess only survival until hospital admission and transport by HEMS. In a study by Wejnarski et al,[25] no deaths were recorded during aeromedical transportation between 2011 and 2016. Therefore, it could be assumed that all or almost all patients transported by HEMS would survive until hospital admission. The main limitation of our study is lack of all data recommended by the European Resuscitation Council to be reported in the case of cardiac arrest.[13] However, in Poland, reported outcomes of patients with OHCA have been related to small subgroups, and the larger ones include only patients with in-hospital cardiac arrest.[26,27] Furthermore, according to the recommended reporting of OHCA, patients with adequate ICD interventions should be regarded as patients with OHCA. These were not included in our study if the ICD intervention was successful. However, the number of such patients admitted to emergency departments, which serve more than 400 000 persons, was 100.[28] Therefore, it could be estimated that there are about 2500 such cases in the whole country annually. Finally, the number of patients who experience ICD shock but do not present to the emergency department should be assessed.

Conclusions The overall rate of OHCA managed by CPR attempts in Poland in 2018 was similar to that recorded in other European countries. The mean survival rate until hospital admission or transport by HEMS was 36.3% and associated with numerous well-known, identified non-modifiable and modifiable factors. A higher rate of interventions with priority code C-2 in patients with OHCA who survived until hospital admission or transport by HEMS than that reported in patients who died at the scene indicates the need to identify predictors of OHCA in emergency calls.

ARTICLE INFORMATION

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CONTRIBUTION STATEMENT All authors confirm that they had full access to data, contributed to drafting the paper, analyzed the data, edited the paper, and approved the final version of the manuscript. KN and DZ designed and coordinated the study.

CONFLICT OF INTEREST None declared.

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