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ORIGINAL ARTICLE

EPIDEMIOLOGICAL ANALYSIS OF CARDIOPULMONARY ARREST CARE ANÁLISE EPIDEMIOLÓGICA DOS ATENDIMENTOS DE PARADA CARDIORRESPIRATÓRIA ANÁLISIS EPIDEMIOLÓGICA DE LA ATENCIÓN DE LA PARADA CARDIORRESPIRATORIA

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ABSTRACT

Objective: to analyze the epidemiological characteristics of victims and occurrences of cardiorespiratory arrest cases in a prehospital environment and their outcomes. **Method:** this is a quantitative, epidemiological and cross-sectional study with victims assisted in advanced life support units and submitted to cardiopulmonary resuscitation. Data were collected from the report of the rescue team. The the Microsoft Office Excel and SPSS 20.0 software were used for statistical analyses. **Results:** there were 163 cases, the median age of the victims was 65 years, they were predominantly male, and presented hypertension and diabetes mellitus. Clinical cause and asystole were more prevalent, with more occurrences in the central region, during the fall, at night. The ambulance response time was lower in the central region. The duration of care was associated with the outcome, being higher among survivors. The main destination of survivors was tertiary hospitals. The immediate survival rate was 25.1%. **Conclusion:** elderly patients with comorbidities were the main victims, with a high mortality rate. It was verified the importance of a rapid and effective response from the emergency service. **Descriptors:** Extra-Hospital Cardiac Arrest; Cardiopulmonary resuscitation; Epidemiology; Emergency Medical Services; Ambulances.

RESUMO

Objetivo: analisar as características epidemiológicas das vítimas e ocorrências de parada cardiorrespiratória em ambiente pré-hospitalar e seus desfechos. **Método:** estudo quantitativo, epidemiológico e transversal, com as vítimas atendidas pelas unidades de suporte avançado de vida, submetidas à reanimação cardiopulmonar. Coletados os dados no relatório de atendimento do socorrista e realizada análise estatística a partir do Microsoft Office Excel e do Software SPSS 20.0. **Resultados:** houve 163 atendimentos, mediana de idade de 65 anos, predominando o sexo masculino, com hipertensão arterial e diabetes mellitus. A causa clínica e a assistolia foram mais prevalentes, havendo mais ocorrências na região central, durante o outono, no período noturno. O tempo-resposta da ambulância foi menor na região central. A duração do atendimento demonstrou associação com o desfecho, sendo maior entre os sobreviventes. O principal destino dos sobreviventes foram hospitais terciários. A taxa de sobrevivência imediata foi de 25,1%. **Conclusão:** idosos com comorbidades foram as principais vítimas, havendo elevada taxa de mortalidade. Verificou-se a importância de uma resposta rápida e eficaz do serviço de emergência. **Descritores:** Parada Cardíaca Extra-Hospitalar; Reanimação Cardiopulmonar; Epidemiologia; Serviços Médicos de Emergência; Ambulâncias.

RESUMEN

Objetivo: analizar las características epidemiológicas de las víctimas y ocurrencias de parada cardiorrespiratoria en ambiente pre-hospitalario y sus desenlaces. **Método:** estudio cuantitativo, epidemiológico y transversal, con las víctimas atendidas por las unidades de soporte avanzado de vida, sometidas a la reanimación cardiopulmonar. Los datos fueron recogidos en el informe de atención del socorrista y fue realizado el análisis estadístico a partir del Microsoft Office Excel y del Software SPSS 20.0. **Resultados:** hubo 163 atendimientos, mediana de edad de 65 años, predominando el sexo masculino, con hipertensión arterial y diabetes mellitus. La causa clínica y la asistolia fueron más prevalentes, habiendo más ocurrencias en la región central, durante el otoño, en el período nocturno. El tiempo-respuesta de la ambulancia fue menor en la región central. La duración del atendimento demostró asociación con el desenlace, siendo mayor entre los sobrevivientes. El principal destino de los sobrevivientes fueron hospitales terciarios. La tasa de sobrevivencia inmediata fue de 25,1%. **Conclusión:** ancianos con comorbilidades fueron las principales víctimas, habiendo elevada tasa de mortalidad. Se verificó la importancia de una respuesta rápida y eficaz del servicio de emergencia. **Descriptores:** Paro Cardíaco Extra-Hospitalario; Reanimación Cardiopulmonar; Epidemiología; Servicios Médicos de Urgencia; Ambulancias.

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INTRODUCTION

Cardiorespiratory arrest (CRA) is defined by the sudden, unexpected and catastrophic cessation of systemic circulation associated with absence of breathing. Around 200,000 CRAs are estimated to happen in Brazil every year, with half of the cases occurring in prehospital settings, thus representing a serious public health problem.¹

There is a consensus that cardiovascular diseases are the main cause of death in Brazil,² and the majority of extra-hospital cardiorespiratory arrest (EHCRA) have presumably a cardiac cause,³⁻⁴ being ventricular fibrillation rhythm the most frequent among ischemic heart diseases.⁵

The first rhythm detected and the response time of rescue units have been demonstrated as predictors of survival, and can indirectly serve to assess the quality of the emergency medical service (EMS).^{4,6} Several studies investigating the nature of EHCRA bring the outcomes and epidemiological analyses related to the gender, age and comorbidities of the victims, as well as to the causes, showing a prevalence of men over 60 years and with cardiovascular diseases and presumably cardiac causes.^{3-4,6} Regarding the occurrence, the place, time and period of year have also been investigated, showing differences in the literature.^{3-4,6-8} All these data point to the importance of knowing the profile of EHCRA cases and victims in order to direct actions and the available resources efficiently to increase survival rates.

It is known that CRA is associated with high mortality and morbidity rates and the success of cardiopulmonary resuscitation (CPR) depends on an efficient health care system. The American Heart Association (AHA) brings the concept of chain of survival, where each link is part of the sequence of actions that should ideally occur to improve CPR success rates and which cannot be considered in isolation, since none of these actions alone are able to reverse most CRAs.^{1,9} The goal of CPR interventions is to support and restore oxygenation, ventilation, and circulation effectively, with a return to intact neurological function.⁹

The shorter the time of displacement, the faster the victim is assisted and the greater the chances of survival.^{4,10} Many variables can have an impact on the outcome of EHCRA, such as the way the EMS is organized and the intrinsic factors of patients.³

There are still few studies of the prehospital component in Brazil, and in the city of the present study no publication was

found. Knowing the number and profile of EHCRA cases and victims becomes essential to identify the most urgent needs related to this problem and direct the strategic distribution of the available resources in order to continuously improve the results obtained.

This study was proposed in view of the morbimortality of cardiovascular diseases, which are the main causes of CRA in prehospital context, and also the fundamental role of prehospital care in the treatment of this health problem.

OBJECTIVE

- To analyze the epidemiological characteristics of victims and occurrences of cardiorespiratory arrest cases in a prehospital environment and their outcomes.

MÉTODO

Quantitative, epidemiological, cross-sectional, retrospective and documentary study. The study was conducted at the Mobile Emergency Care Service (SAMU) of the city of Londrina (PR), Brazil. Londrina had an estimated population of 548,249 inhabitants in 2015.¹¹ The SAMU of Londrina was implemented in September 2003 and today has two Advanced Life Support Units (ALSU) and four Basic Life Support Units to serve the city. The inclusion criteria were all CRA patients attended by the ALSU team in the prehospital setting who underwent cardiopulmonary resuscitation from January 1, 2015, to December 31, 2015, aged 10 years and older, according to the classification of adolescence from this age, as established by the World Health Organization.¹²

The chosen age classification is justified by the protocol of care and the chain of survival systematized and disclosed by the American Heart Association whose procedures are also standardized from adolescence onwards.⁹

Data collection took place between March and May of 2016. The data source was the reports of emergency rescue teams (RERT) of the SAMU filled by the physician, nurse, nursing technician or lifeguard, archived in the service. All RERT for the year 2015 were checked and then only the records that met the inclusion criteria were manually separated for data collection.

The data collection instrument was prepared according to the data available in the reports.

In RERT, there was the AMPLE framework: Allergies; Medications in use; Previous diseases; Last Meal; Events that preceded the occurrence. However, it was decided not to

include all these data, due to lack of information in the vast majority of data sheets that would prevent the statistical analysis or description; only the comorbidities and events that preceded the occurrence were chosen to be listed.

Data were tabulated and stored in of the Microsoft Office 365 Excel spreadsheets, coding the variables into Arabic numbers, proceeding with double typing. After the validation of the database in the Excel software, the information was transferred to the SPSS 20.0 software, where a descriptive analysis was performed to describe the results. The non-parametric Chi-Square, Pearson and Fisher's Exact tests were used to verify the existence of significant associations, and the Mann-Whitney test was used for the quantitative variables, as the variables had no normal distribution. A significance level of 5% was adopted in this study.

According to Resolution nº 466/2012 of the National Health Council on research involving human beings, this research was approved by the Committee on Ethics and Research Involving Human Beings of the State University of Londrina - UEL under the opinion nº 666.503 - CAAE: 05931612.8.005231 . This

study was funded and sponsored by the researchers.

RESULTS

In 2015, there were 470 calls of SAMU to assist cardiorespiratory arrests, and in 294 occurrences there was no indication of intervention and 13 actions had intervention only by the Basic Support Unit.

Finally, there were 163 cases of CRA victims who underwent CPR by the ALSU of the SAMU in prehospital contexts. From the total number of victims, 100 were male (61.3%), 62 were female (38%) and 1 was unknown (0.6%).

The age ranged from 15 to 95 years, with a mean of 60.68 years, and median of 65 years (SD = 20.1), with 75% of the individuals being 75.5 years old. The age was noted in 155 cases (95.1%). Among female victims, the median age was 70 years and for males, 60 years.

Regarding comorbidities, data was present in only 89 records (54.6%). The following table describes the findings. It is noted that the total number of comorbidities exceeds the number of victims, because several patients had more than one comorbidity. The distribution of the first rhythm detected according to sex is also presented in Table 1.

Table 1. Comorbidities of the victims of cardiorespiratory arrest assisted by the Advanced Life Support Unit of SAMU and the first detected rhythm, according to sex. Londrina (PR), Brazil, 2015. (Comorbidities N = 89); (First rhythm N = 163)

Variable	Male		Female		Total	
	N	%	N	%	N	%**
<i>Comorbidities</i>						
Arterial hypertension	25	28.1	26	29.2	51	57.3
Diabetes Mellitus	13	14.6	13	14.6	26	29.2
Neurological diseases *	10	11.2	09	10.1	19	21.3
Cardiopathy	08	9.0	06	6.7	14	15.7
Other	11	12.3	10	11.2	21	23.5
Deny	06	6.7	01	1.1	07	7.8
Not registered	51	57.3	23	25.8	74	83.1
<i>First rhythm</i>						
VF/VT ***	13	8.0	04	2.4	17	10.4
AESP ****	11	6.7	09	5.5	21	12.9
Asystolia	21	12.9	19	11.6	40	24.5
Ignored	55	33.7	30	18.4	85	52.1

* Sequelae of cerebrovascular accident or cardiorespiratory arrest, convulsive syndrome, myasthenia gravis, neurocysticercosis, dementias.

** Percentage of total data found

*** Ventricular Fibrillation/Ventricular Tachycardia without Pulse

**** There was a sex ignored at this rhythm of CPR

The category "other" includes psychiatric disorder, liver disease, chronic kidney disease, neoplasias, as well as habits such as drug addiction, alcoholism and/or smoking.

It was emphasized that there was no association between the survival or death outcome and the first rhythm detected with p = 0.758 and between sex and first rhythm found, p = 0.228.

About the events that preceded the CRA, there was information in only 38 reports

(23.3%). Among the findings, the main event was the complaint of chest pain in eight victims (25.0%), followed by dyspnea and trauma, both recorded in seven visits (21.9%). There were also other less prevalent events preceding CRA such as choking, substance abuse, headache, hypoglycemia, seizures, pukes, diarrhea, sweating and electric shock.

Among the causes of CRA, the majority were of clinical nature, with 126 victims (77.3%), 31 (19%) had external causes, and six

(3.7%) were ignored. There was no association of the cause of CRA with the outcome, with a $p = 0.657$ in the chi-square test. In the distribution per sex, males accounted for 77.4% of external causes and 55.5% in clinical causes; one victim had unknown sex in this cause of CRA.

Table 2 shows the regions of the city where there were occurrences, showing the distribution according to the survival and death outcome to which there was no statistical association. The central region had the largest number of occurrences.

Table 2. Distribution of cardiorespiratory arrest cases per region in the city according to survival and death outcomes. Londrina, Paraná, Brazil, 2015. (N = 163)

Location	Survival		Death		Total		p*
	N	%	N	%	N	%	
Center	15	36.6	26	63.4	41	25.2	0.222
North Zone	08	27.6	21	72.4	29	17.8	
South Zone	04	16	21	84	25	15.3	
East zone	07	29.2	17	70.8	24	14.7	
West Zone	04	15.4	22	84.6	26	16.0	
Others**	02	12.5	14	87.5	16	9.8	
Ignored	01	50	01	50	02	1.2	

* Chi-Square Test
** Metropolitan area, rural area.

With the analysis of the concentration of occurrences per inhabitants in each region, we observed that the largest concentration was in the center of the city, where there is 86,114 people out of a total of 506,701 in all the territory of the municipality, according to the last census conducted in 2010 (LONDRINA, 2016), corresponding to 17% of the population and 25.2% of occurrences. On the other hand,

the northern part of the city had a smaller proportion of occurrences in relation to its population, 17.8% and 24.9%, respectively, and the rural area with only one occurrence (0.6%), with 2.6% of the population of Londrina.

Table 3 analyzes the ambulance response time in each region and between the survival and death outcomes.

Table 3. Analysis of ambulance response time per region and time spent in care provision in cases of survival and death outcomes. Londrina, 2015. (Region N = 161)*; (Time spent in care provision N = 160)

Region								
Center	41	5.80	2.61	02	4.0	5.0	7.0	11
North Zone	29	8.97	3.20	04	6.5	9.0	10.0	20
South Zone	24	8.67	3.29	04	7.0	8.0	10.0	15
East zone	23	7.00	3.46	02	5.0	6.0	9.0	17
West Zone	26	10.58	3.85	05	7.0	10.5	14.25	19
Others**	16	21.13	16.45	10	12.0	17.5	21.5	77
Ignored	02	9.00	4.20	06	6.0	9.0	-	12
Duration of care provision								0.003
Survival	41	70.43	27.00	24	51.25	66.5	90	143
Death	119	57.22	29.25	08	37.5	50.0	74	161

* N was lower than the number of calls because there were some reports without the intervals filled.
** Mann-Whitney test.
*** Metropolitan area, rural area.

Regarding the time for provision of care, a greater interval was observed in the survival group compared to the death group, demonstrating an association with the outcome with $p < 0.005$ (Table 3).

Table 4 shows the distribution of occurrences according to the time of the day, days of the week and seasons.

Table 4. Distribution of occurrences by time of the day and comparative analysis between survival and death outcomes. Londrina-Pr, 2015. (N = 163)

Variable	Survival		Death		Total		p*
	N	%	N	%	N	%	
							0.311
<i>Time of the day</i>							0.595
Morning	11	24.4	34	75.6	45	27.6	
Afternoon	14	32.6	29	67.4	43	26.4	
Night	10	18.9	43	81.1	53	32.5	
Dawn	06	27.3	16	72.7	22	13.5	
<i>Day of the week</i>							0.421
Sunday	05	19.2	21	80.8	26	15.9	
Monday	05	23.8	16	76.2	21	12.9	
Tuesday	04	14.8	23	85.2	27	16.6	
Wednesday	10	38.5	16	61.5	26	15.9	
Thursday	06	26.1	17	73.9	23	14.1	
Friday	04	23.5	13	76.5	17	10.4	
Saturday	06	27.3	16	72.7	22	13.5	
Ignored	01	100	00	0	01	0.6	0.421
<i>Season of the year</i>							
Summer	12	31.6	26	68.4	38	23.3	
Autumn	16	27.6	42	72.4	58	35.6	
Winter	05	15.2	28	84.8	33	20.2	
Spring	08	23.5	26	76.5	34	20.9	
* Chi-square test							

In the distribution of occurrences by month of the year, there was a greater concentration of cases in the months of March, April and June, representing together more than a third of the cases. Autumn had the majority of occurrences, as shown in Table 4, however, this data did not show an association with outcome. There was an average of 13.6 cases per month.

Among all the victims assisted, 41 (25.1%) had immediate survival and were referred to a health service still alive, being tertiary hospitals such as the Brotherhood of Santa Casa de Londrina (ISCAL) followed by the University Hospital and Evangelical Hospital of Londrina the main destinations, with 15, 11 and eight victims, respectively. The other 122 victims (74.9%) died *in situ* or during transportation, and among these, the main destination was the ACESF (Administration of Cemeteries and Funeral Services of Londrina), followed by the Institute of Legal Medicine (ILM), to which 45 and 12 victims were referred, respectively. This information was non-existent in 67 RERT, 2 of which were from survivors and 65 from the death cases.

DISCUSSION

The median age found in this study and the highest proportion of males among CRA victims have been reported in the national literature. However, the literature considered only patients aged 18 years or more.⁶⁻⁷ There are also similarities to a study conducted in Botucatu, where 68.4% of the CRA victims were 60 years old or older.¹³ An international study also showed a similar sex ratio and age range, with 64.2% of the victims being males and with a median age of 70 years among men

and 78 among women. There was also statistical significance in the median age among the victims who had return of spontaneous circulation (RSC), who were aged 65 years, and those who died *in situ*, aged 74 years.³ These findings corroborate another Spanish study.⁴

Although male mortality is concentrated in young adults, justified by external causes, reaching values up to 4.5-fold higher in relation to the female population, among the elderly this rate continues higher, although with smaller differences, 1.5 to 1.7-fold higher.¹⁴

Although there has been a significant reduction in mortality due to cardiovascular diseases in Brazil since the 1980s, possibly due to the strong economic development, with a consequent improvement in living conditions and access to treatment technologies, cerebrovascular and ischemic heart diseases continue to rank first among causes of death, with a higher mortality rate among men and among the elderly,¹⁵ populations that were more present in the present study.

Analyzing the comorbidities or underlying diseases of CRA patients based on reports is very complex because the cause of CRA involves many factors that can be underestimated, underreported and even underdiagnosed.⁶ Yet, it is known that the higher prevalence of arterial hypertension and diabetes mellitus found among the CRA victims in the present study demonstrates the profile of victims with risk factors for cardiovascular diseases.¹⁵

The clinical cause was the most reported, present in 77.3% of the cases, along with comorbidities and chest pain and dyspnea as

the main complaints before CRA. Thus, we can suggest that CRA of cardiac nature was more prevalent. In the literature, it is also observed that the majority of extra-hospital cardiorespiratory arrest (EHCRA) have presumably cardiac cause.^{4,16}

Although less frequent, external causes of CRA represent a considerable proportion that must also be investigated, since there are not many publications addressing these causes in relation to cases of CRA of cardiac origin. A population-based study conducted in Japan showed an average age of 66.8 years, with the majority of victims of the male sex and asystolia at the first rhythm detected. The hospital admission rate was 29.2% and survival one month after CRA was 5.3%, with a favorable neurological outcome in 1.3% of the victims.¹⁰ It should be noted that the present study also showed a majority of males among external causes.

The first rhythm detected at the arrival of the ambulance is significantly associated with survival. The lower the ambulance arrival time, the greater is the likelihood of finding a shockable rhythm and the greater is the probability of Spontaneous Circulation Return (SCR),^{4,17} and the greater the age, the lower is the chance of identifying a shockable rhythm.¹⁷

Among the recorded rhythms, information available in only 47.9% of the records, asystolia was the main one, present in 51.3% of the victims, considering only the available data, followed by AESP and then, shockable rhythms. Two studies conducted in Belo Horizonte showed that half of the occurrences of CRA assisted by SAMU initially found an asystolic rhythm, also occurring by AESP and VF/VT, but among the victims who survived, most had an initially shockable rhythm.⁶⁻⁷

Considering that the first shockable rhythm is also a measure of the effectiveness of the System¹⁸ and that for every minute between calling the ambulance and the arrival at the place of occurrence the chance of finding a shockable initial rhythm is reduced by 8%, the majority of the rhythms found was asystolic, considered to be of worse prognosis and final rhythm, may be related to the characteristics of the local emergency system, the time of activation, possibly due to poor dissemination and implementation of population training programs, low availability of external automatic defibrillator (EAD) in the community and ambulance response time.

Regarding the spatial distribution of occurrences, the majority of cases occurred within the city of Londrina. In some occasions, the SAMU was able to assist cases of cities of

the metropolitan region, justifying the fact that the neighboring cities have only basic life support ambulances, requiring help in these occurrences.

The greater concentration of occurrences in the central zone can be justified by the greater agglomeration of people and commerce, hospitals and medical clinics, bus and metropolitan terminals, and a greater flow of passers-by.

Although there was no statistical significance in the association between region and outcome, there were significant differences in ambulance response time between some regions, which in addition to immediate survival may influence survival after 30 days of the event¹⁶ and favorable neurological prognosis.¹⁹ The lower the ambulance response time, the greater is the probability of survival.^{4,17}

The ambulance response time considered in this study consists of the interval between calling the ambulance and the arrival of the SAMU team at the place of occurrence, being extremely important to be known and analyzed because it significantly affects mortality and morbidity.^{16,19}

We verified that the central region had the smallest median response time, of five minutes. This response time can be considered adequate for an emergency, and it is similar to that found in developed countries.¹⁶ The fact that the SAMU base is unique within the city and is strategically placed in the central region, explains the short response time. The northern and western zones had the largest medians of time among the urban areas of the city.

Considering that for each minute without CPR the chances of survival of a CRA victim fall from 7 to 10%,¹ the response times presented in these two regions practically extinguished the chances of obtaining return of spontaneous circulation in these patients, unless a spectator had already started to apply CPR maneuvers, what is not frequent in the Brazilian reality.⁶

Early recognition and activation of the EMS by the lay public is extremely important, as well as starting CPR maneuvers until the arrival of the SAMU. Training the lay public is an interesting strategy to increase the chances of survival of the CRA victims, especially in a reality in which the emergency response time can be time consuming.

Although in the Brazilian reality it has been recommended by ministerial regulations that the SAMU has to reach the victim as early as possible after an injury occurs,²⁰ there are no

defined parameters about the optimal times since a call at the emergency control center until the arrival of the ambulance to the place of the occurrence.

In the city of Kanazawa, Japan, similar in size to Londrina, a system called *FAST (Fast Emergency Vehicle Preemption System)* was implemented as part of the traffic control system to assist police cars and ambulances by giving them priority in traffic lights along the route. This system works by means of devices installed on vehicles that interact with infrared headlamps scattered along the way that proceeds with the pre-emission of the traffic signals. The implantation of this system led to a significant decrease in the response time of the emergency medical service with a positive impact on the survival of the victims one year after the occurrence, being of 7% in the group equipped with *FAST* and 2.8% without *FAST*.²¹

Solutions that require more advanced technology such as Japan may not be within the reach of our current reality. However, resources such as use of Global Positioning System (GPS) for fast localization of unknown locations and traffic education in order for drivers to facilitate the passage of vehicles in an organized and adequate way can help the optimization of the displacement of the vehicles with a smaller response time.

Although the regional SAMU has decentralized bases, there is only one base within the perimeter of the city. Thus, the proposal of decentralization of the bases in the municipality mentioned is a suggestion to decrease the response time and improve the results of the calls that are mostly time dependent. This is the model of Belo Horizonte⁷ whose bases are decentralized. This way, when there is a case of CRA, the nearest BHU (Basic Health Unit) is called to initiate the resuscitation maneuvers until the arrival of the ALSU, increasing the chances of survival of these victims by means of an early CPR.

A simulation study carried out in France showed that the reallocation of resources available on a strategic basis can improve the coverage and response time of the SAMU, as the emergency mobile unit is also named in that country.²²

As the base in the studied city is the only one, the call must occur with the necessary resource to the event, that is, with the Basic Life Support (BLS) or Advanced Life Support (ALS). It is the responsibility of the control center to decide, based on the information passed by the person who makes the call, the

nature and seriousness of the occurrence and allocate the necessary resource.

A possible difficulty for the response time and activation of the appropriate vehicle is the insufficient information provided by the caller. In a study that aimed to analyze the requests for care of CRA victims, it was demonstrated that in 38.8% of the calls the information was considered insufficient for suspicion of CRA. The difficulty can be attributed to transmitting clear and objective information about what happened to the victim, to the fact that people may be under a strong stress when possible CRA is perceived.²³

The fact that the longest time of care was seen in the group of survivors can be explained by the hypothesis that more effort by the SAMU team was dedicated to patients who had a greater chance of surviving the CRA. Patients who were considered to have a lower chance of CPR due to several factors such as advanced age, comorbidities, prognosis, and long or unknown CRA time can lead the team to reduce the efforts in the CPR. It is important to mention that this time interval refers to the care as a whole and does not only reflect the duration of the CPR, as this information is not available in the source consulted.

On the other hand, a study that aimed to determine the relationship between the duration of CPR in prehospital environments and survival with favorable neurological prognosis verified that the longer the duration of CPR, the lower were the chances of survival and of favorable neurological prognosis. Survival declines when CPR efforts exceed 10 minutes and more rapidly when time exceeds 30 minutes.²⁴ Yet, some variables such as initial shockable rhythm should be considered when deciding whether to suspend CPR efforts or not, and there is no exact recommendation on the CPR time.⁹

Following with the temporal analysis, most occurrences happened in the night period followed by the morning period. This result is different from that found in two studies carried out in Belo Horizonte, where the morning had most of the occurrences, followed by the evening.⁶⁻⁷

Although no association between survival and time of day has been demonstrated, there is evidence of the association between ambient temperature and mortality. Extreme temperatures cause an increase in acute cardiovascular events and diurnal temperature variation is associated with various cardiovascular diseases such as ACS (Acute Coronary Syndrome) and heart failure with an impact on cardiovascular mortality.²⁵

An observational study conducted in several countries with different climates showed that cold had a greater contribution on temperature-related mortality as well as extremes of temperature.²⁶ This helps to explain the findings of more occurrences in the Autumn, the coldest month, when there is also a great variation of temperatures throughout the day and between close days. An American study found that the winter was the season with the highest incidence of EHCRA and lower survival rate.²⁷

The relationship between time of day and outcomes in EHCRA victims was evaluated in an international study, showing that there was no statistically significant difference between nocturnal and daytime occurrences as regards return of spontaneous circulation (RSC). However, survival at 30 days was significantly lower when CRA occurred at night time. Also, in this study, the ambulance response time was higher at night.⁸

As for the days of the week, there was no difference in the incidence between the weekend and the weekdays, as opposed to an American study that showed a higher incidence between the Friday and Monday, possibly justified by behavioral changes in days approaching weekends, such as alcohol use, physical activity, sleep cycle and wakefulness.²⁷

Regarding the referrals of victims with immediate survival, the main destinations were the city's tertiary hospitals that meet SUS demand. This indicates that the profile of the public served in the majority did not have health insurance plans, or else, that there was no one to confirm information. It is worth mentioning that SAMU takes patients both to the public network and to the private network, depending on the physical condition of the victim and the structure of the health service, and the victim himself is responsible for the costs that can be generated by the use of private institutions. In the present study, two victims were referred to a private health institution.

The rest of the victims who died *in situ* or during transportation had as their main destination the ACESF (Administration of Cemeteries and Funeral Services of Londrina), a municipal authority responsible for providing funeral services to the population. When the external cause was known or suspected, the body was referred to the Institute of Legal Medicine (ILM).

The lack of important information due to the incomplete completion of RERT was also a limitation mentioned by other Brazilian authors.⁶⁻⁷

The source of the data did not have a specific field to inform the detected rhythm, contributing to the considerable absence of this information. And even when there was room for filling in specific information, such as the referral of the victim, there was a great lack of information. Thus, the search for data after the occurrence of the events and access only through the information described in the RERT was another limitation of the study.

Education of SAMU workers through the nucleus of emergency education, existing in the institution, becomes necessary to reinforce the responsibility of the professionals on the correct filling of information inherent to the services rendered.

Another essential point suggested is the systematic training of the lay public to recognize a CRA, as well as the behaviors to be adopted starting with calling the SAMU and beginning CPR maneuvers; this training can have a significant impact on the survival of the victims.

The decentralization of SAMU bases, as it already occurs in other cities, can contribute to decreasing the ambulance response time and the survival and decrease of sequelae of the victims of CRA and other diseases assisted by the service, which are mostly time-dependent.

CONCLUSION

The majority of the victims were male, with a median age of 65 years; the median age was higher among females. The most frequent comorbidities were hypertension and diabetes mellitus. The main cause of CRA was of clinical nature and asystolia was the most frequent rhythm. The region of the city where the event occurred did not show an association with the survival outcome; however the central zone had the highest concentration of occurrences and the shortest response time, with longer interval times found within the city, in the north and west. It was verified the importance of a rapid and effective response from the emergency service.

The duration of care was greater in the group of survivors, demonstrating that the efforts are greater among victims with more chance of survival, reinforcing the importance of recognition and early CPR.

As for the distribution of occurrences by months, season, days of the week and period of the day, there was no association with the outcome, except for a greater concentration of occurrences in the autumn. The survival

rate was 25.1% and among the survivors, the main destination was tertiary hospitals that serve the SUS.

The findings of the study provide a reflection on the profile of victims of cardiorespiratory arrest and the care provided by the prehospital service of the city, bringing suggestions that may direct the actions of the public power in order to optimize the available resources and guide new work actions.

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