In-Hospital Post-Cardiopulmonary-Cerebral Resuscitation Survival Prognostic Factors

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Objective

To assess clinical and demographic characteristics of patients who had cardiopulmonary resuscitation and identify short- and long-term survival prognostic factors.

Methods

Four hundred and fifty-two (452) resuscitated patients in general hospitals from Salvador were prospectively assessed through bivariate and stratified analysis in associations between variables and survival curve for a nine-year evolution assessment.

Results

Age ranged from 14 to 93 years old, mean of 54.11 years old. Male gender patients prevailed and half of them had at least a base disease. Cardiovascular disease was the responsible etiology in 50% of cases. Cardiac arrest was observed in 77% of cases and only 69% of patients were immediately resuscitated. Initial cardiac rhythm was not diagnosed in 59% of patients. Asystole was the most frequent rhythm (42%), followed by ventricular arrhythmia (35%). Immediate survival was 24% and hospital discharge survival 5%. Cardiac arrest etiology, initial cardiac rhythm diagnosis, ventricular fibrillation or tachycardia as arrest mechanism, pre-resuscitation estimated time lower than or equal to 15 minutes and resuscitation time lower than or equal to 5 minutes were recognized as short-term prognostic factors. Non-administration of epinephrine, being resuscitated in private hospital and resuscitation time lower than or equal to 15 minutes were nine-year evolution survival prognostic factors.

Conclusion

Data may help healthcare professionals decide when start or stop in-hospital resuscitation.

Key words

cardiopulmonary resuscitation, cardiac arrest, prognosis, general hospitals

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Despite huge technological advancements in the last decades, early death due to cardiovascular disease has still been a great challenge for intensive medicine all over the world. In the USA, it has been the main cause of death since 1900, except in 1918[1]. In Brazil, 820 deaths due to cardiovascular diseases take place every day, which represents six times acquired immunodeficiency syndrome mortality rate[1]. Mortality due to acute myocardial infarction is approximately 30%, most of them suddenly and more than 50% cannot make to the hospital in time. Mortality rate decreases from 30% to 10%[2] among patients who have access to proper advanced life support treatment.

In-hospital cardiopulmonary-cerebral resuscitation (CPCR) prognosis is gloomier than outside it. Despite advanced in-hospital life support access, patients have higher disease co-morbidity and severity than those showing cardiac arrest in extra-hospital environment[3].

Immediate survival perspective towards in-hospital resuscitation ranges from 30% to 50%[4-6], whereas hospital discharge survival varies from 5% to 35%[5,7], with a mean from 11% to 20%[4,8-10].

This study aimed at assessing clinical and demographic characteristics of in-general hospital CPCR-submitted patients, through identification of short- and long-term survival prognostic factors in order to help healthcare professionals decide when to start or stop resuscitation.

Methods

We prospectively assessed 452 CPCR-submitted patients between July 1 and December 31, 2004, in one of the six general hospitals completing the study in the city of Salvador. Patients under 14 years old or those resuscitated before hospital admission were excluded from the study.

Cardiopulmonary-cerebral arrest (CRCA) was regarded as sudden ceasing of circulatory, respiratory, and cerebral functions, proven by the central pulse (carotid and/or femoral), ventilatory movements (apnea) absence, or agonic respiration and coma status[11].

CPCR was taken into consideration whenever the patient had basic or advanced life support by means of ruling recommendations from American Heart Association, aiming at the return of spontaneous circulation[11].

Immediate survival was regarded at the time return of spontaneous circulation was achieved. It was considered for study purpose as cardiac rhythm keeping measurable pulse and/or blood pressure through palpation and/or auscultation, or when systolic pressure greater than or equal to 60 mmHg was monitored through intra-arterial cannulation, for at least an hour in the absence of external cardiac massage[9,12].

Tardive survival was taken at hospital discharge and long-term survival a year after post-CPCR survival[13].

Data were recorded in Utstein[13]-style similar questionnaire sheets. We assessed the following variables: 1) Pre-CRCA patient variables: a) demographic: sex and age; b) clinical: base disease and etiology. 2) CRCA variable: witnessed or not, estimated pre-resuscitation time, access to medications, adrenalin use and dosage, initial cardiac rhythm, defibrillation use, ventilatory support provided, interventions made. 3) Result variables: immediate survival/return of spontaneous circulation; tardive survival (hospital discharge) and long-term survival (a year or longer).

Survivors were in-hospital followed-up by assistant physician and research group and assessed through direct interviews or with relatives whenever their clinical condition did not allowed for. After discharge, besides direct interviews, patients were followed-up by telephone, mail, information from assistant physician or relatives.

The study should have been epidemiological, without any diagnostic or therapeutic intervention. The team collected data with simple and direct questions on patient health condition, his/her welfare, with no risk or damage evidence and/or physical or psychological constraint for the patient or his/her relatives.

Thus the project was submitted to and approved by Comissão de Ética para Análise de Projetos de Pesquisa (Ethics Commission for Research Project Assessment) - CAPPesq of Diretoria Clínica do Hospital das Clínicas and Faculdade de Medicina da Universidade de São Paulo, without conferring to application of reported consent in specific form.

Resuscitated patients had their features described by univariate analysis by using mean and proportion descriptive assessment. Exact binomial confidence interval was calculated to estimate sampling populations. Bivariate analysis was then applied to assess the association among several patient and arrest characteristics (independent variables) with immediate survival (return of spontaneous circulation).

Association between return of spontaneous circulation and the two main prognostic independent variables from bivariate analysis (pre-resuscitation estimated time and resuscitation time) was carried out through stratified analysis and controlled through a third interest variable. Gross, combined and per stratum relative risks were calculated and homogeneity of relative risks between stratums through Mantel test statistics was tested.

Cox multivariate regression, "Proportional Hazards Regression", was applied to estimate study variable proportional risk model, altogether on survival time and for the choice of variables included in Kaplan-Meier survival analysis. Kaplan-Meier technique was used to calculate incidence density, incidence density rate, and respective confidence intervals for pre-selected variables. Estimate of long-term survival probability was carried out from survival curves by applying Kaplan-Meier survival functions.

Significance level of 5% (a= 0.05) was used in all study stages. Database used was Epidata version 2.1 b (Epidata

Association, Denmark) and STATA version 7.0 (Stata Corporation, Texas-USA) was the statistic package employed.

Results

From 452 CPCR-submitted patients, 345 (76.3%) had immediate death and 107 (23.7%) achieved return of spontaneous circulation. From 107 survivors, 31 (6.9%) died in the first 24 post-resuscitation hours. Fifty-one (11.3%) patients, from 76 (16.8%) who survived for more than 24 hours, died in the first month. Only 25 (5.5%) patients survived for more than one post-CRCA month and nine (2%) of those died up to one post-CRCA year. After a year, only 16 (3.5%) initial cohort patients were alive (fig. 1).

Main clinical and demographic characteristics of CPCR-submitted patients are displayed in tables 1 and 2. Concerning arrest location, ER was the most frequent with 155 (34.3%) CPCRs, followed by 138 (30.53%) in-ICU CPCRs, and 97 (21.46%) in-ward CPCRs. Despite being in-hospital, 101 (23.17%) of CRCAs were not witnessed. From 452 patients, only 106 (23.3%) were defibrillated and 60 (67.4%) of those had a total of joules lower than and/or equal to 750. Twenty-nine (32.6%) of them had a total load higher than 750 joules. Most patients, 311 (71.5%), received oxygen ventilatory prosthesis and were AMBU- (*Automatic Mobile Breathing Unit*) ventilated, and 91 (20.9%) of them were under mechanical ventilation. Medications were peripheral vein administrated in 223 (57.5%) patients, with central vein used in 166 (42.8%) and orotracheal tube medication in 20 (5.1%) patients. Adrenalin was used in CPCR of 319 (87.2%) patients. In 196 (70.3%) the dose was lower than 5 mg, 65 (22.9%) received between 5 to 10 mg and 11 (3.9%), from 11 to 15 mg. In 8 (2.9%) CPCRs, adrenalin dose was higher than 16 mg.

Table III shows bivariate analysis results for clinical and demographic variable assessment of CPCR-submitted patients and immediate survival (return of simultaneous circulation).

Results from association between immediate survival (return of spontaneous circulation) and estimated pre-resuscitation time as main variable, controlled by a third interest variable, are shown in table IV. Table V shows results for resuscitation time as the main immediate survival (return of spontaneous circulation) association assessment variable.

Use of adrenalin, resuscitation time higher than 15 minutes and be resuscitated in a public hospital were Cox proportional regression independent variables with statistically significant prognostic value for death risk. Patients using adrenalin had 58% higher death risk, which was statistically significant (p = 0.02). Resuscitation time higher than 15 minutes was higher death risk prognosis in 37% (relative risk 1.37; p = 0.01); Public hospital CPCR increased death risk in 37% (p = 0.007). Those

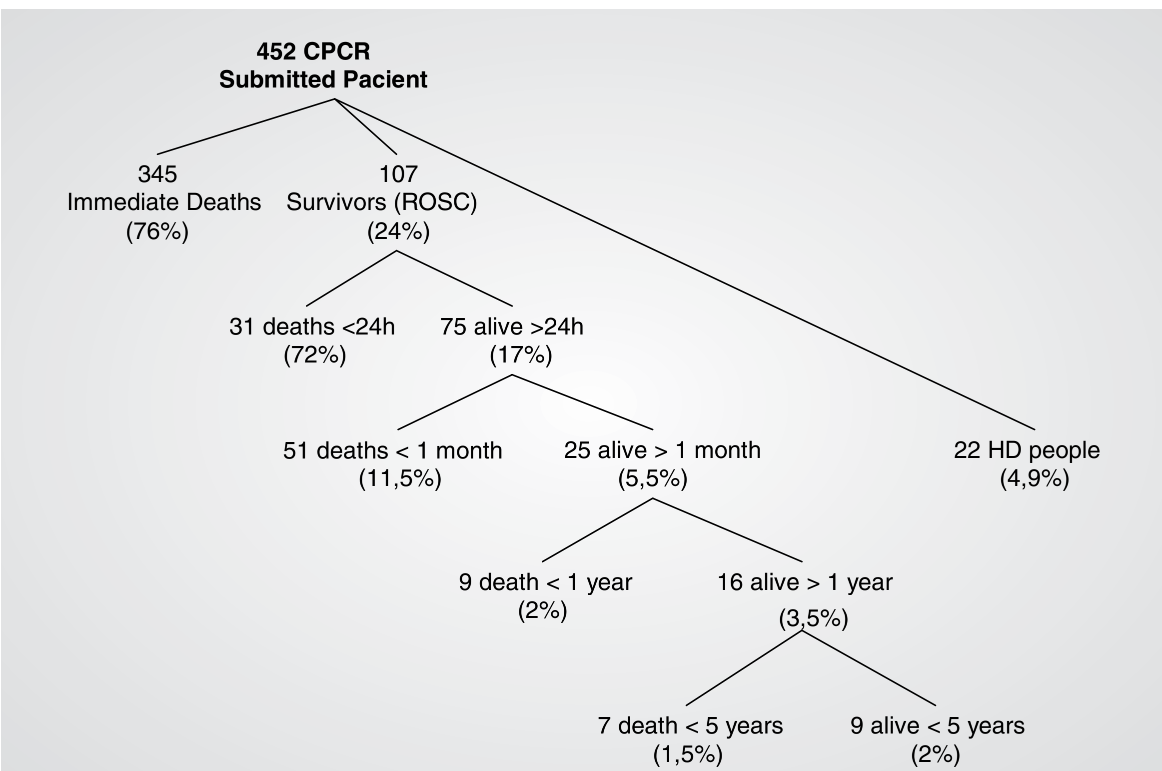

Fig. 1 *- Results from 452 in-general hospital CPCR*
?????? RCRC=Reanimação cardiorespiratória cerebral; RCE=Retorno a circulação espontânea; AH=Alta hospitalar ????

Table I - Clinical and demographic characteristics of CPCR-submitted patients

Characteristics	n	%	Accum. %
Demographic			
Sex			
Male	248	54.87	54.87
Female	204	45.13	100.00
Clinical			
Base Disease			
None	63	15.00	15.00
One	229	54.52	69.52
Two	92	21.90	91.43
Three	27	6.43	97.86
Four	7	1.67	99.52
Five	2	0.48	100.00
Undetermined*	32	7.08	
Etiology			
Cardiovascular	214	49.31	49.31
Trauma	77	17.74	67.05
Pneumopathy	75	17.28	84.33
Other	34	7.83	92.17
Infection/sepsis	21	4.84	97.01
Neoplasia	11	2.53	99.54
Intoxication	2	0.46	100.00
Undetermined*	18	0.44	
Age Range			
14-19	30	6.90	6.90
20-29	43	9.89	16.79
30-39	43	9.89	26.67
40-49	52	11.95	38.62
50-59	65	14.94	53.57
60-69	85	19.54	73.11
70-79	72	16.55	89.66
>80	45	10.34	100.00
Undetermined*	17	3.76	
Total	452*	100	

*Note: univariate descriptive analysis; *percentage in relation to total of patients (n=452). CPCR= Cardiopulmonary-cerebral resuscitation*

three variables were sent for survival curve assessment. The 107 CPCR surviving patients, as well as the 22 discharged ones were followed up for survival time assessment. Three periods of time were assessed: from zero to 30 post-CRCA days; from one month to a year after CRCA; and from zero to nine years, which were the base for achieving survival curves according to hospital type (fig. 2- A), adrenalin use (fig. 2-B) and resuscitation time (fig. 2-C).

Discussion

Return of spontaneous circulation and hospital discharge survivors has been distressing and significantly unchanged in the last three decades, despite CPCR technological advancements. In-hospital CPCR needs studies to better understand its characteristics, results and peculiarities[8,13,14], unlike already better studied extra-hospital CPCRs[15-22].

Situation among medical professionals is even more worrying as there are few published works on the matter and only two national literature reports concerning results and prognosis of in-hospital resuscitated patients[23, 24].

The most important and frequently analyzed variables were prospectively assessed in this study, with the aim of studying their prognostic value. There is no other study, among the most mentioned, which has simultaneously assessed so many in-hospital cardiac arrest patient characteristics. From those, only two are prospective[6,8]. Such sampling represents the eighth greatest number of CRCA studied patients who were resuscitated, when compared to 33 more frequently mentioned in-hospital CPCR studies [5,6,23-26].

Our sample showed a 14 to 93-year old population, with mean age of 54 years old, and 21.5% standard deviation. No evidences show age alone as important prognostic factor in extra-hospital post-resuscitation survival, as it is not a criterion to counterindicate resuscitation in extra-hospital cardiac arrest aged patients.

Table II - CRCA and CPCR intervention characteristics

CRCA variable	n	%	Accum. %
Witnessed CRCA			
No	101	23.17	23.17
Yes	335	76.83	100.00
Undetermined*	16	3.54	
Estimated pre-resuscitation time			
0 to 1'	286	68.92	68.92
1' to 5'	82	19.76	88.68
5' to 10'	26	6.27	94.94
10' to 15'	16	3.86	98.80
15' to 30'	5	1.20	100.00
Undetermined *	37	8.19	
Initial Rhythm			
Asystole	78	41.71	41.71
Ventricular fibrillation	65	34.76	76.47
AESP	31	16.58	93.05
Ventricular tachycardia	13	6.95	100.00
Undetermined *	265	58.63	
Resuscitation time			
0 to 1'	9	2.23	2.23
1 to 5'	28	6.95	9.18
5 to 10'	49	12.16	21.34
10 to 15'	79	19.60	40.94
15 to 30'	142	35.24	76.18
30 to 60'	76	18.86	95.03
>60	20	4.96	100.00
Undetermined *	49	10.84	
Defibrillation			
No	297	73.70	
Yes*	106	23.30	
Undetermined	49	10.84	
Adrenalin Use			
Yes	319	87.16	
No	47	12.84	
Undetermined	86	23.50	
Total	366	100.0	

* Percentage in relation to total of patients (n=452). CRCA=Cardiopulmonary-cerebral arrest; CPCR= Cardiopulmonary-cerebral resuscitation; AESP=Electrical activity without pulse

Table III - Clinical and demographic variable and intervention association in immediate survival CPCR-submitted patients (Return of Spontaneous Circulation)

	Immediate Survival					
	ROSC +	ROSC -	Total	Inc.	RR	CI 95%
Sex	n	n	n			
Male	52	195	248	0.2096	0.78	0.56 1.09
Female	55	149	204	0.2696		
Age Range						
≤ 60 years old	55	177	232	0.237	1.00	0.72 1.40
> 60 years old*	52	167	219	0.2344		
Base disease						
Absent	8	66	74	0.1081	0.4	0.20 0.78
Present*	98	263	361	0.2714		
Etiology						
Cardiovascular	64	150	214	0.2990	2.3	1.25 4.25
Trauma *	10	67	77	0.1298	1.24	0.79 1.96
Pneumopathy *	18	57	75	0.24	1.6	0.97 2.71
Others*	14	61	75	0.1866		
Adrenalin Use	(n)	(n)	(n)			
No	16	31	47	0.3404	1.36	0.87 — 2.11
Yes*	80	239	319	0.2507		
Adrenalin dosage						
≤ 5 mg	66	152	218	0.3027	1.68	0.95 — 2.97
> 5 mg*	11	50	61	0.1803		
Estimated pre-resuscitation time						
≤ 5'	99	268	367	0.2697	2.53	1.09 — 5.9
> 5'*	5	42	47	0.1063		
Initial rhythm determination						
Yes	65	122	187	0.3475	2.2	1.56 — 3.10
No*	40	213	253	0.1581		
Initial rhythm						
VT/VF	31	47	78	0.3974	1.94	1.38 — 2.73
AESP/asystole*	74	208	374	0.2044		
Resuscitation time						
≤ 15'	64	101	165	0.3878	2.43	1.71 — 3.44
> 15'*	38	200	238	0.1596		

**Reference stratum - which relative risk refers to (denominator) - bivariate analysis.*
CPCR= Cardiopulmonary-cerebral resuscitation; ROSC=Return of spontaneous circulation; VT= Ventricular tachycardia; VF= Ventricular fibrilation; AESP=Electrical activity without pulse

Table IV - Association between immediate survival (return of spontaneous circulation) and estimated pre-resuscitation time, as main variable, controlled by a third interest variable (co-variables)

Independent Variables (co-variable)	Reference Stratum Relative Risk(*)	Favorable Stratum Relative Risk (**)	Combined Relative Risk (***)	Gross Association Relative Risk (****)	p value
Adrenalin dosage	> 5mg 5.96	≤ 5mg 1.54	2.39	2.52	0.1822
Hospital profile	Público 2.26	Privado 1.73	2.04	2.52	0.75
Resuscitation time	> 15' 0.83	≤ 15' 10.79	2.71	2.52	0.004
Rhythm determination	No 3,68	Yes 1,05	2.02	2.52	0.1094
Adrenalin used	Yes 1.35	No -	1.6	2.52	-
Initial rhythm	> 2 AESP/ASYS 3.68	≤ 2 VF/ VT 1.05	2.02	2.52	0.1094
Etiology	Others 2.03	CVD 2.95	2.4	2.52	0.6727

Note: Gross and combined relative and per stratum risks calculated through Mantel-Haenszel test. (*) reference stratum; (**) favorable stratum; (***) adjusted/combined; (****) gross association (bi-variate). AESP= Electrical activity without pulse; ASYS= Asystole; VF= Ventricular fibrilation; VT= Ventricular tachycardia; CVD= Cardiovascular desease

Table V - Association between immediate survival (return of spontaneous circulation) and resuscitation time, main variable, controlled by a third interest variable (co-variables)

Independent Variables (co-variables)	Reference Stratum Relative Risk(*)	Favorable Stratum Relative Risk (**)	Combined Relative Risk (***)	Gross Association Relative Risk (****)	p value
Adrenalin dosage	> 5mg 2.34	≥ 5mg 2.49	2.44	2.43	0.8709
Hospital	Public 2,24	Private 2,87	2.61	2.43	0.4972
Rhythm determination	No 3.09	Yes 2.65	2.80	2.43	0.6848
Adrenalin used	Yes 2.67	No 7.28	2.92	2.43	0.2993
Initial rhythm	> 2 AESP/ ASYS 3.09	≤ 2 VF/ VT 2.64	2.80	2.43	0.6848
Etiology	others 2.10	CVD 2.84	2.50	2.43	0.3999

Note: Gross and combined relative and per stratum risks calculated through Mantel-Haenszel test. (*) reference stratum; (**) favorable stratum; (***) adjusted/combined; (****) gross association (bi-variate).AESP= Electrical activity without pulse; ASYS= Asystole; VF= Ventricular fibrilation; VT= Ventricular tachycardia; CVD= Cardiovascular desease

Table VI - Independent (prognostic) variable proportional risk estimate under study, concurrently on survival time through Cox proportional regression

Variable Study	Hazard ratio	CI 95 %	Standard Error	p value
Adrenalin	1.58	1.08 - 1.75	0.31	0.02
(used) Resuscitation time>15'	1.37	1.08 - 2.31	0.17	0.01
Hospital profile (public)	1.37	1.09 - 1.72	0.16	0.007

Note: Log-Log graph used to meet Cox regression presuppositions

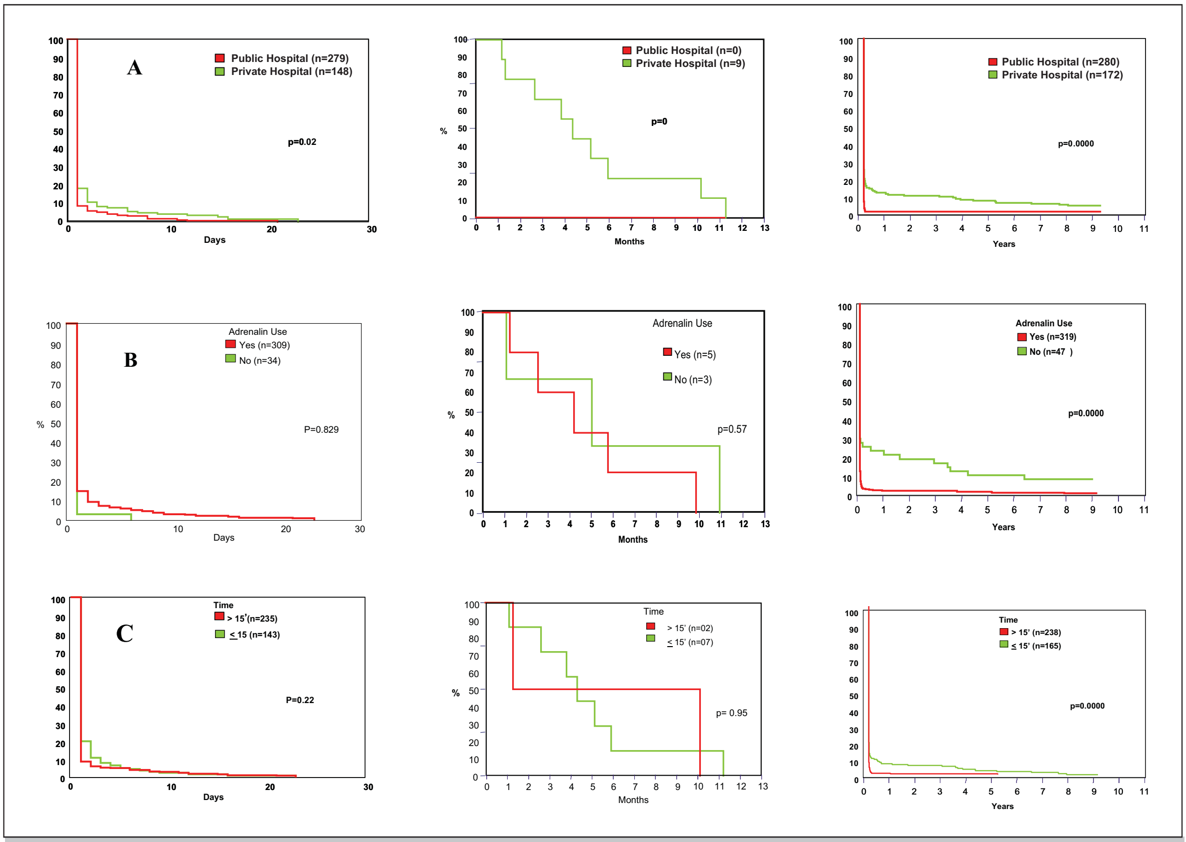

Fig. 2 - Survival curves according to hospital type (A), adrenalin use (B) and resuscitation time (C) in the first 30 days, in the period from 1 month to 1 year and in the period from 0 to 9 years (Kaplan-Meier technique was used)

Age had already been regarded as survival prognosis. Currently, most studies conclude age does not directly interfere with survival[6,27]. Timerman et al[23] observed unfavorable prognosis under 10 and over 70-year-old patients. However, such observation was not maintained in multivariate analysis. Likewise, in our study, age was not shown as predictor variable, as no statistically significant difference was found in bivariate analysis (relative risk: 1.0; 0.72 – 1.40; confidence interval: 95%), as well as in Cox multivariate analysis. Many authors support that base diseases may cat as confusion factor, as there is a trend for aged patients of having higher comorbidity.

By assessing CPCR-submitted patient sex, we noted that our data correspond to those from literature. That shows a slightly greater incidence among men. Such variable does not interfere with survival. In our study, women had approximately 30% more chance of immediate survival than men, which is not statistically significant[7,8,23].

Cardiovascular disease is the most frequent cardiac arrest cause[4,8], and also the one with the best response to treatment, due to the highest frequency of ventricular arrhythmia in this group, which has a better prognosis.

In our study, cardiovascular disease was the main cause of cardiac arrest in almost 50% of the cases, followed by trauma (17%) and pneumopathy (17%). By taking cardiovascular diseases as survival favorable stratum, we observed an immediate survival chance almost two and a half times higher than trauma. Bedell et al[8] noted in their studies that no patient who had pneumonia or sepsis, as arrest etiology, survived hospital discharge.

In literature, base disease (subjacent) is regarded as the most prognostic powerful variable in patient survival[4,23]. Studies have been showing a better survival of patients without associated, clinically diagnosed base disease compared to those who had it. Some authors noted the decrease of survival percentage according to associated disease number. Hershey and Fisher[7] observed in their studies that nearly 50% of survivors did not show any associated base disease in comparison to 6.5% survivors who had three subjacent illnesses. Timerman et al[23] also described base disease as the greatest prognosis variable in survival determining, which was not observed in our study. Statistically significant immediate survival occurrence in non-apparent base disease patients was 10%, in comparison to 27% in those with at least one base disease (relative risk = 0.40; 0.20 to 0.78; confidence interval 95%). Such difference from literature results may be partially explained for some reasons, which have drawn attention of some researchers: great resuscitation assessment complexity, studied population diversity, varied etiologies with different severity levels, several hospital admission causes, which are often underestimated and non-notified[13].

Ventilatory support type assessment for resuscitated patients showed orotracheal intubation (71.5%) as the most frequent initial approach. According to emergency care protocols[11], only 26.4% had bag-valve-mask with reservoir as first approach ventilatory support. In this study, nearly 21% of resuscitated patients were intubated and placed under mechanical ventilation. That may represent higher severity of those patients facing resuscitation procedures, as in Bedell et al[8] study, mortality of patients who needed intubation was five times higher than those without the need for it. Similar results were also observed by Robson and Hess [5].

In a 927-patient field study carried out in Seattle, in 1976, 123 (22%) from 569 witnessed CRCA patients survived, in comparison to only 14 (4%) from 358 with non-witnessed CRCA[28]. When CPCR starts on the street, at CRCA place, by somebody who witnesses it and helps the victim, survival rates are higher than those without instant care by a helper[18,20,28-31]. Witnessed CRCA patients showed better return of spontaneous circulation and hospital discharge rates than individuals with non-witnessed CRCA[8,13,20,28,31].

Many studies have confirmed that the shorter the times, the greater the victim survival chances are. When basic life support is provided in less than 4 minutes and advanced life support in less than 8, hospital discharge survival may vary from 36% to 70%[20,29,32,33].

Very important for extra-hospital CPCR studies, time variable has been currently more appraised in assessing in-hospital CPCR results. Many studies have demonstrated that in witnessed CRCAs, in which estimated pre-resuscitation time tends to be shorter, survival is greater than in non-witnessed. In BRESUS study[6], 2,838 CRCAs were assessed. Witnessed CRCA patients had 48% of return of spontaneous circulation in comparison with 32% who were found under CRCA.

We included in our study assessment a commonly used variable in extra-hospital studies that is not in-hospital assessed, which is estimated pre-resuscitation time. It measures the interval between CRCA collapse and/or recognition until CPCR start. Such time interval can be real, when measurement-subjected, or estimated, as usually happens due to complexity, unpredictability, and stress determined by CRCA situation. In our study from 452 cardiac arrests, 335 (76.83%) were witnessed. However, immediate resuscitation took place in only 286 (68.92%). That means an estimated pre-resuscitation time shorter than 1 minute. We clearly observed there was a time lapse between arrest identification and a procedure-making for rendering proper care, in a significant sample portion: 49 CRCAs (7.91%). Why did it happen? Were people unable to care for? Was there any structure? We also noted that patients who had estimated pre-resuscitation time shorter than or equal to 5 minutes, their survival chance was 2.53 (1.09-5.0; confidence interval 95%) times higher than those who had estimated time higher than 5 minutes, which was very significant, both clinically and statistically. Observed and literature available data show this variable to determine time taken to start resuscitation is more efficient in predicting in-hospital survival prognosis studies than simply assess whether the arrest was witnessed, as usually analyzed in studies.

Resuscitation time is regarded as the most powerful prognostic variable on resuscitation results. In Bedell et al study[8] in patients with CRCA time higher than 15 minutes, survival decreased from 65% to 5%, and no one survived over 30 resuscitation minutes. In our study, from 165 patients with resuscitation time shorter than or equal to 15 minutes, 64 (38.78%) had return of spontaneous circulation, with a statistically and clinically significant survival chance of 2.43 times higher than the higher time stratum. Those variables kept their prognostic value when assessed in stratified multivariate model, by being concurrently analyzed with other interest co-variables.

Concerning arrest mechanism rhythm we know ventricular fibrillation is the most frequent CRCA rhythm observed in most studies and also the one with the best response to treatment, with higher survival rates[8,9,34-36]. Survival chances are better if CRCA patients under ventricular fibrillation have an early approach, since as time goes by, myocardial reversibility decreases due to hypoxemia and acidemia.

In our study, almost 60% of patients did not have determined cardiac arrest rhythm. Asystole was the most frequent among those the rhythm could be determined. From 106 patients who had defibrillation, only 78 cases showed ventricular arrhythmia, which evidenced an overestimated fibrillation number. That could have been an injurious factor influencing our results. Prognostic value of whether determining CRCA initial cardiac rhythm was assessed as shown by the high indetermination percentage of 58.63% (265 CPCRs in 452 CPCRs). We noted patients who had their rhythm determined had a clinically and statistically significant 2.2 (1.55-3.1; confidence interval: 95%) times more chances to survive CRCA.

Our data showed a statistically and clinically significant return of spontaneous circulation rate (relative risk: 1.94; 1.38-2.73) almost twice as higher for patients who had ventricular arrhythmia as CRCA initial rhythm. Such observed data fully corroborate with those from literature[9,13,37].

Asystole was the most frequent initial rhythm noted in our study and that is maybe a reaction from delay in initial care we noted. Such observation may have cause a decrease in the number of verified ventricular fibrillation, with a delay in initial care, evolving to asystole, which is the most unfavorable rhythm to reversion.

For a long time, epinephrine was the most important drug in CRCA approach[38,39]. However, its CPCR injurious beta-adrenergic effects[40] have been recently questioned. The importance of searching for a more efficient and safe alternative than epinephrine in classic dosage of 0.1 mg/kg, recommended in American Heart Association protocols[11,41,42], has already been understood. Such trend has been recently achieved with the last recommendations from American Heart Association: epinephrine went from class I to undetermined class[32], pointing at the need for better controlled clinical assays in order to determine the real role of that drug and its indications. We analyzed survival association with who used epinephrine or not. A favorable survival chance of 36% for who did not use epinephrine was noted (relative risk: 1.36; 0.87-2.11; confidence interval: 95%). However, it maybe did not represent statistically significant due to the sample. When comparing who used epinephrine considering administrated dosage, we observed a clinically and statistically significant favorable immediate survival incidence for those who used dosage lower than or equal to 5 mg of the referred drug, nearly 70 %,.

Kyff et al[4] found the worst survival results among ward-resuscitated patients (4.5%). Many studies also showed that ward CRCA, besides more frequent, had worse results. Another study, assessing 79 in-general hospital patients, noted survival among ward-resuscitated patients was lower, only 3%[7], when compared to other in-hospital locations. Those data confront ours, contributing to explain hospital discharge results os 5%.

This group was 9-year evolution followed, with no loss of segment among those 22 hospital discharged resuscitated patients, which increases analysis power[23,43] very much. Such fact is important because there has not been many prospective in-hospital CPCR studies[6,8]. Thus, variables with more survival analysis power – resuscitation time, type of hospital and use and non-use of epinephrine, assessed in short- and medium-term (from one month to one year) and long-term (nine years) - from Cox multivariate regression analysis, were selected.

By assessing short- and long-term patient survival, we note: 1) private hospital mortality rate (0.5%) was 15 times lower when compared to public hospital rate (7.5%), showing a statistically significant difference ($p = 0.0000$). There was also a favorable statistically significant difference for a lower mortality in approximately 20% in private hospital in the first 30 days; 2) Patients who did not use epinephrine had a statistically significant difference of 12.5 times more chance of survival, comparing with those who used it ($p=0.0000$); 3) Nine-year assessment for those who had resuscitation time shorter than or equal to 15 minutes showed almost 20 times higher survival chance.

Some researchers demonstrated that certain clinical and demographic characteristics from patients, who have cardiac arrest and receive resuscitation, are associated to a greater survival chance. However, there has not been any efficient prognostic model assisting healthcare professionals so far. Those aspects highlight the need for new studies, aiming at clarifying CPCR main variable prognostic value and their consequences on immediate and long-term resuscitation results.

Information exposed may provide assistance to frontline healthcare professionals, involved with potentially severe and/or sudden death risk patients, who are therefore involved with the possibility of having to resuscitate and better decide when starting and when stopping resuscitation efforts.

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