Original Article

Cardiopulmonary Resuscitation-Induced Consciousness (CPRIC): Occurrence and Perception of Health Professionals and Firemen

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Abstract

Background: Cardiopulmonary Resuscitation-Induced Consciousness (CPRIC) is rare and poorly understood, impacting the effectiveness of Cardiopulmonary Resuscitation (CPR). In Brazil, investigating the prevalence and characteristics of CPRIC is essential in order to improve protocols and properly train health professionals and firefighters.

Objectives: To investigate the occurrence of CPRIC and to verify the knowledge and experience of health professionals and firefighters concerning this phenomenon.

Methods: This work was a cross-sectional observational study conducted with 507 professionals from different regions of Brazil who work directly with resuscitation maneuvers. An online questionnaire, containing 19 questions about professional profile, experience in cardiopulmonary arrest (CPA), and knowledge and recognition of CPRIC, was used. Data were analyzed using descriptive and inferential statistical techniques, including unpaired Student's t-test and chi-square test, along with logistic regression to calculate the odds ratio (OR). The level of statistical significance was $p<0.05$.

Results: The CPRIC presence rate was 0.22%, with 57.2% of the professionals reporting prior knowledge of the phenomenon. Inferential analysis showed that profession, number of CPAs witnessed in the last year, and specialization were significantly associated with CPRIC knowledge.

Conclusion: Limited understanding and variability in exposure highlight the need to update CPRIC management guidelines, incorporating specific guidance on CPRIC.

Keywords: Cardiopulmonary Resuscitation; Heart Arrest; Consciousness.

Introduction

Cardiopulmonary arrest (CPA) is a serious medical emergency characterized by the abrupt cessation of cardiac and respiratory functions, leading to imminent death if not treated promptly and effectively.[1,2] Its diagnosis is based on the assessment of responsiveness, respiration, and pulse, and its rhythms are classified as asystole, ventricular fibrillation, pulseless ventricular tachycardia, and pulseless electrical activity.[3]

Adequate response to CPA begins with early recognition and immediate activation of emergency medical services.[4] Cardiopulmonary resuscitation (CPR) is the essential intervention to restore blood circulation and oxygenation of vital organs.[5] Current guidelines recommend high-quality chest compressions, with a rhythm of 100 to 120 compressions per minute, associated with ventilation with a compression-to-ventilation ratio of 30:2, in the absence of an advanced airway.[6]

Recently, a remarkable phenomenon has been observed during CPR, called Cardiopulmonary Resuscitation-Induced Consciousness (CPRIC). This phenomenon involves the manifestation of signs of brain activity in patients during a CPA, even though spontaneous blood circulation does not return.[5,7,8] CPRIC includes behaviors such as eye opening, agonal breathing, increased jaw tone, responses to painful stimuli, intentional arm movements, and verbal and nonverbal communication with the resuscitation team.[5]

CPRIC is considered rare, occurring in less than 1% of in-hospital CPA cases.[3] Although the physiological mechanisms are not fully understood, it is believed that rapid identification and quality of compressions during CPR are related to its occurrence. Effective compressions maintain a minimum mean arterial pressure and approximately 30% of the normal cardiac output, in turn reducing ischemic damage and neuronal death.[8,9] With the increasing efficiency of prehospital systems, the incidence of CPRIC has increased, which can negatively impact the quality of CPR and patient prognosis by potentially inducing interruptions in the process.[10,11]

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Central Illustration: Cardiopulmonary Resuscitation-Induced Consciousness (CPRIC): Occurrence and Perception of Health Professionals and Firemen

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The occurrence of CPRIC significantly impacts the effectiveness of resuscitation maneuvers and can compromise the patient's outcome. The need to interrupt high-quality chest compressions to assess and document signs of induced consciousness can reduce cerebral blood flow and the oxygenation of vital organs, impairing the possible return of spontaneous circulation (ROSC) and increasing the risk of irreversible brain injury. Furthermore, decision-making about whether or not to continue CPR in cases of CPRIC is complex and can generate ethical and legal dilemmas for the care team.[12,13]

Given the growing relevance of the phenomenon and the need for a better understanding of its occurrence and clinical implications, the present study aims to investigate the occurrence of CPRIC, in addition to verifying the knowledge and experience of health professionals and firefighters regarding this phenomenon.

Central Illustration contain a summary of the main data of the article.

Methodology

This is a cross-sectional observational study using data obtained through the application of a self-administered questionnaire, intended for professionals who regularly participate in CPR procedures. The sample consisted of physicians, nurses, nursing technicians, and firefighters. Participants were selected through electronic dissemination of the questionnaire, which was distributed via social networks and professional contacts, reaching professionals from different regions of Brazil. However, the selection did not consider regional particularities or the proportional distribution of professionals by location, thus reflecting a comprehensive but non-stratified sample. The option for a non-probabilistic convenience sample was due to the difficulty of obtaining a complete and updated list of all professionals working in the area of CPR throughout the country, in addition to the intention of obtaining a significant response in a short period of time. Data collection was performed through a questionnaire developed by the authors, based on the phenomena of CPRIC, as described in the Australian study.[3] The questionnaire covered the following aspects: the professional's profile and academic background, the professional's experience in CPA situations, knowledge about CPRIC, and the ability to recognize and identify signs associated with CPRIC.

The questionnaire, containing 19 questions, was made available online through the Google Forms platform from January to March 2024. Participants were invited to answer the questionnaire after reading and accepting the Free and Informed Consent Form (FICF), which guaranteed the confidentiality of the information and respect for the ethical principles of the research.

Statistical analysis

The collected data were analyzed using descriptive and inferential statistical techniques, using the R software.[14] For the descriptive analysis, continuous variables were expressed as

mean and standard deviation, while categorical variables were presented as count and frequency (percentage).

Two distinct inferential analyses were performed. The first analysis compared the characteristics of the participants based on their knowledge of CPRIC. The normality of continuous variables was verified by the Komogorov-Smirnov test, with the Student's t-test being used when appropriate. For categorical variables, such as profession and place of work, the chi-square test or Fisher's exact test were applied when deemed appropriate. All analyses were two-tailed, considering an alpha error of 0.05. The second analysis used the same statistical methodology to compare participants who had already witnessed the CPRIC.

To identify more precise associations between the variables studied and the outcome of interest (Knowledge of CPRIC or Witnessing CPRIC), the statistical differences found in each analysis were subsequently submitted to a logistic regression model to calculate the odds ratio (OR), considering a 95% confidence interval for the gross and adjusted data. The presence of multicollinearity in the models was verified through the Variance Inflation factor.

To determine the incidence rate of CPRIC, all interviewees were asked about the number of years of experience in CPA and the average frequency of CPA services provided. Based on these two numbers, the total number of CPAs attended by each interviewee was estimated. The incidence of CPRIC was estimated considering the number of interviewees who stated that they had already witnessed a CPRIC as the numerator and the total number of CPAs estimated according to the methodology described as the denominator.

This study was approved by the ethics committee, logged under CAAE 70440923.0.0000.5498.

Results

The present study included the participation of 507 professionals from different regions of Brazil, including physicians, nurses, nursing technicians and firefighters, working in the intra-hospital (IH) context and/or in pre-hospital care (PHC), with an average age of 41 years (Standard deviation, SD = 8.4) and predominantly male (58.2%). Among the participants, 57.2% were familiar with CPRIC, and 39.4% stated that they had witnessed at least one episode. The demographic and professional characteristics of the sample, as well as the inferential analysis of the data, are presented in Table 1, regarding knowledge of CPRIC, and in Table Y in relation to having witnessed CPRIC. Nurses and physicians made up the majority of professionals who are familiar with and have witnessed CPRIC episodes. Professionals with more than twenty years of experience and those who have witnessed more than twenty CPAs in the last year are more likely to be familiar with CPRIC. Most of these professionals worked in advanced life support units and had a specialization in the area.

Analysis of Factors Associated with Knowledge and Witnessing of CPRIC

The variables profession, place of work, number of CPAs witnessed in the last year and having a specialization were analyzed for their association with one's knowledge of CPRIC. The univariate logistic regression analyses of the adjusted model for these variables are presented in Table 3.

The inferential analysis showed that profession, time of work, number of CPAs witnessed in the last year and having specialization were significantly associated with knowledge of CPRIC ($p < 0.05$). In the adjusted model, the variable with the greatest positive impact on knowledge of CPRIC is the high frequency of CPAs witnessed in the last year (especially more than 50 CPAs). Working in an RU shows a negative association, while having a specialization shows a marginally positive association. These results indicate that intense practical experience and specialization are more influential factors for knowledge of CPRIC than profession or type of work (with the exception of working in an RU).

The professional's area of activity and the number of CPAs witnessed in the last year were analyzed according to their association with having witnessed a CPRIC. In the adjusted model, the most relevant factor for the experience of having witnessed a CPRIC was working in Emergency Care. Working in BLS had a significant negative association, while other variables, such as the number of CPAs witnessed, were less relevant.

Signs of CPRIC

Among professionals who witnessed a CPRIC, the most commonly reported signs included: opening one's eyes and attempts to interfere with CPR maneuvers, followed by psychomotor agitation and moaning. The full description is found in Table 4.

CPA behaviors and rhythms during CPRIC

As can be seen in Table 6, the most common procedure adopted by professionals when witnessing an episode of CPRIC was checking the pulse, followed by stopping cardiac massage. The most common cardiac rhythms found were ventricular fibrillation and pulseless electrical activity.

ROSC

According to Table 7, among the patients who presented signs of CPRIC, 128 had ROSC. Of these, 71.5% were male, 65.0% were adults, 24.5% were elderly, and 4.5% were children or adolescents.

Discussion

This study investigated the knowledge, experience, and immediate conduct adopted by health professionals and firefighters when faced with CPRIC. Considering a sample of 507 professionals, the rate of CPRIC presence was 0.22%, which is in line with the rates reported in the study by Olaussen et al.,[10] which ranged from 0.23% to 0.9%. The results indicated that the performance and number of CPAs witnessed were significantly associated with knowledge and having witnessed CPRIC. The number of CPAs witnessed in the last year is the most relevant factor for knowledge of CPRIC, while the performance in Emergency Care is the most relevant for witnessing CPRIC. These findings highlight the relevance of CPRIC in the clinical context and the need for greater understanding and preparation of professionals to deal with these cases.

Table 1 – Descriptive and inferential analysis of professional data from the study population (n=507) in relation to knowledge of CPRIC

Characteristics	Total n = 507 (%)	Familiar with CPRIC n = 290 (%)	Not familiar with CPRIC n = 217 (%)	P-value
Average age and SD	41± 8.4	41.5 ±8.6	41.0± 8.4	0.20
Male	295 (58.2)	172 (59.5)	123 (56.7)	0.58
Professions				
Firefighter	115 (22.7)	51 (17.6)	64 (29.5)	
Nursing technician	42 (8.3)	18 (6.2)	24 (11.1)	< 0.05
Nurse	262 (51.7)	166 (57.2)	96 (44.2)	
Doctor	88 (17.3)	55 (19.0)	33 (15.2)	
Worked in PHC				
ALS	187 (36.9)	131 (45.2)	56 (28.8)	
ILS	38 (7.5)	26 (9.0)	12 (5.5)	< 0.05
BLS	68 (13.5)	31 (10.7)	37 (17.1)	
RU	75 (14.8)	28 (9.7)	47 (21.7)	
Worked in IH				
Emergency care	156 (30.8)	101 (34.8%)	55 (25.3%)	0.03
Critical care unit	80 (15.8)	48 (16.6%)	32 (14.7%)	
Time worked				
One year or less	24 (4.7)	13 (4.5)	11 (5.1)	
Between one and five years	70 (13.8)	36 (12.5)	34 (15.7)	0.12
Between five and 10 years	111 (21.9)	68 (23.4)	43 (19.8)	
Between 10 and 20 years	195 (38.5)	102 (35.3)	93 (42.8)	
More than 20 years	107 (21.1)	71 (24.5)	36 (16.6)	
CPAs witnessed in the last year?				
None	78 (15.4)	37 (12.8)	41 (18.9)	
Between one and five	131 (25.8)	65 (22.4)	66 (30.4)	
Between five and 10	100 (19.7)	53 (18.5)	47 (21.7)	< 0.05
Between 10 and 20	87 (17.2)	55 (19.0)	32 (14.7)	
Between 20 and 50	76 (15.0)	51 (17.6)	25 (11.5)	
More than 50	35 (6.9)	29 (10.0)	6 (2.8)	
Specialization	328 (64.7)	212 (73.1)	116 (53.5)	< 0.05
State capital	209 (41.2)	130 (44.8)	79 (36.4)	0.07
Region				
Southeast	407 (80.3)	238 (82.1)	169 (77.9)	
South	45 (8.9)	20 (6.9)	25 (11.5)	0.34
North and Northeast	30 (5.9)	18 (6.2)	12 (5.5)	
Midwest	25 (4.9)	14 (4.8)	11 (5.1)	
Add to current guidelines?				
Yes	392 (77.3)	231 (79.3)	161 (74.2)	0.13
No	61(12)	35 (12.1)	26 (12.0)	
I don´t know	54 (10.7)	52 (17.9)	30 (13.8)	
Inclusion of sedation in CPA?				
Yes	61 (12.0)	41 (14.1)	20 (9.2)	0.11
No	343 (67.7)	197 (67.2)	146 (67.3)	
I don´t know	103 (20.3)	52 (17.9)	51 (23.5)	

CPRIC: Cardiopulmonary Resuscitation-Induced Consciousness; PHC: Pre-hospital care; ALS: Advanced Life Support (manned by a doctor and a nurse); ILS: Intermediate Life Support (manned by 2 nurses); BLS: Basic Life Support (manned by a nursing technician); RU: Rescue Unit (manned by a firefighter); APH: pre-hospital care, IH: In-hospital; CPA: Cardiopulmonary Arrest; SD: Standard deviation. Source: Created by the authors.

Table 2 – Descriptive and inferential analysis of professional data from the study population (n = 507) in relation to having witnessed CPRIC

Characteristics	Total n = 507 (%)	Witnessed CPRIC n = 200 (%)	Did not witness CPRIC n = 307 (%)	Valor de p
Average age and SD	41± 8.4	41.1± 7.9	41.0±8.8	0.69
Male	295 (58.2)	111 (55.5)	184(59.9)	0.40
Profession				
Firefighter	115 (22.7)	40 (20.0)	75 (24.4)	
Nursing technician	42 (8.3)	13 (6.5)	29 (9.4)	0.28
Nurse	262 (51.7)	113 (56.5)	149 (48.5)	
Doctor	88 (17.3)	34 (17.0)	54 (17.6)	
Worked in PHC				
ALS	187 (36.9)	81 (40.5)	106 (34.5)	
ILS	38 (7.5)	13 (6.5)	25 (8.1)	< 0.05
BLS	68 (13.5)	12 (6.0)	56 (18.2)	
RU	75 (14.8)	28 (14.0)	47 (15.3)	
Worked in IH				
Emergency care	156 (30.8)	75 (37.5%)	81 (26.4)	< 0.05
Critical care unit	80 (15.8)	36 (18.0%)	44 (14.3)	
Time worked				
One year or more	24 (4.7)	13 (6.5)	11 (3.6)	
Between one and five years	70 (13.8)	27 (13.5)	43 (14.0)	0.20
Between five and 10 years	111 (21.9)	38 (19.0)	73 (23.8)	
Between 10 and 20 years	195 (38.5)	85 (42.5)	110 (35.8)	
More than 20 years	107 (21.1)	37 (18.5)	70 (22.8)	
CPAs witnessed in the last year?				
None	78 (15.4)	32 (16.0)	46 (15.0)	
Between one and five	131 (25.8)	40 (20.0)	91 (29.6)	
Between five and 10	100 (19.7)	37 (18.5)	63 (20.5)	0.04
Between 10 and 20	87 (17.2)	41 (20.5)	46 (15.0)	
Between 20 and 50	76 (15.0)	30 (15.0)	46 (15.0)	
More than 50	35 (6.9)	20 (10.0)	15 (4.9)	
Specialization	328 (64.7)	139 (69.5)	189 (61.6)	0.08
State capital	209 (41.2)	76 (38)	133(43.3)	0.27
Region				
Southeast	407 (80.3)	162 (81.0)	245 (79.8)	
South	45 (8.9)	18 (9.0)	27 (8.8)	0.97
North and Northeast	30 (5.9)	11 (5.5)	19 (6.2)	
Midwest	25 (4.9)	9 (4.5)	16 (5.2)	
Add to current guidelines?				
Yes	392 (77.3)	158 (79.0)	234 (76.2)	0.76
No	61(12)	22 (11.0)	39 (12.7)	
I don´t know	54 (10.7)	20 (10.0)	34 (11.1)	
Inclusion of sedation in CPA?				
Yes	61 (12.0)	32 (16.0)	29 (9.4)	0.06
No	343 (67.7)	126 (63.0)	217 (70.7)	
I don´t know	103 (20.3)	42 (21.0)	61 (19.9)	

CPRIC: Cardiopulmonary Resuscitation-Induced Consciousness; PHC: Pre-hospital care; ALS: Advanced Life Support (manned by a doctor and a nurse); ILS: Intermediate Life Support (manned by 2 nurses); BLS: Basic Life Support (manned by a nursing technician); RU: Rescue Unit (manned by a military firefighter); IH: In-hospital; CPA: Cardiopulmonary Arrest; SD: Standard deviation. Source: Created by the authors.

Table 3 – OR (95% confidence interval) for the association between professional characteristics and knowledge of CPRIC for the 507 interviewees

	Gross model	Adjusted model
Profession		
Firefighter	Reference	Reference
Nursing technician	0.94 (0.46 – 1.92)	0.51 (0.21 – 1.19)
Nurse	2.17 (1.39 – 3.40)	0.53 (0.22 – 1.21)
Doctor	2.09 (1.19 – 3.71)	0.54 (0.21 – 1.35)
Occupation		
Doesn´t work	Reference	Reference
ALS	2.05 (1.30 – 3.26)	1.55 (0.92 – 2.61)
ILS	1.90 (0.91 – 4.19)	1.87 (0.84 – 4.31)
BLS	0.74 (0.41 – 1.32)	0.69 (0.32 – 1.47)
RU	0.52 (0.29 – 0.92)	0.40 (0.16 – 0.97)
CPAs witnessed in the last year?		
None	Reference	Reference
Between 1 and 5	1.09 (0.62 – 1.92)	1.17 (0.65 – 2.12)
Between 5 and 10	1.25 (0.69 – 2.27)	1.24 (0.65 - 2.37)
Between 10 and 20	1.90 (1.03 – 3.57)	1.67 (0.85 – 3.33)
Between 20 and 50	2.26 (1.18 – 4.38)	1.69 (0.82 – 3.53)
More than 50	5.36 (2.11- 15.60)	3.92 (1.46 – 11.95)
Specialization	2.37 (1.63 – 3.44)	1.71 (1.00 – 2.92)

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Table 4 – OR (95% confidence interval) for the association between professional characteristics and having already witnessed CPRIC for the 507 interviewees

	Gross model	Adjusted model
Occupation		
Doesn´t work	Reference	Reference
ALS	1.22 (0.78 – 1.92)	0.77 (0.46 – 1.29)
ILS	1.10 (0.53 – 2.32)	0.65 (0.28 – 1.43)
BLS	0.50 (0.28 – 0.90)	0.27 (0.13 – 0.57)
RU	0.74 (0.42 – 1.29)	0.90 (0.47 – 1.74)
Work in a hospital		
Doesn´t work	Reference	Reference
Emergency care	1.89 (1.27 - 2.84)	1.73 (1.10 - 2.72)
Critical care unit	1.67 (1.00 - 2.78)	1.55 (0.89 - 2.70)
CPAs witnessed in the last year?		
None	Reference	Reference
Between 1 and 5	0.94 (0.58 – 1.41)	0.61 (0.33 – 1.13)
Between 5 and 10	1.66 (0.92 – 3.04)	0.95 (0.49 – 1.83)
Between 10 and 20	1.73 (0.93 – 3.22)	1.40 (0.71 – 2.79)
Between 20 and 50	2.26 (1.18 – 4.38)	1.02 (0.50 – 2.10)
More than 50	3.74 (1.57 – 9.75)	1.86 (0.79 – 4.48)

CPRIC: Cardiopulmonary Resuscitation-Induced Consciousness; PHC: Pre-hospital care; ALS: Advanced Life Support (manned by a doctor and a nurse); ILS: Intermediate Life Support (manned by 2 nurses); BLS: Basic Life Support (manned by a nursing technician); RU: Rescue Unit (manned by a military firefighter); CPA: Cardiopulmonary Arrest. Source: Created by the authors.

Table 5 – Descriptive analysis of professionals who reported having witnessed CPRIC (n = 200), with each interviewee allowed to declare more than one sign

Sign	n (%)
Eye opening	111 (55.5)
Attempt to interfere with CPR maneuvers (pushing, locating, pulling, grabbing, removing)	75 (37.5)
Psychomotor agitation	70 (35.0)
Groaning	69 (34.5)
Speech	2 (1.0)
Biting on orotracheal tube or laryngoscope blade	2 (1.0)
Face contraction	1 (0.5)
Apparent return of consciousness	1 (0.5)
Visible heartbeat (chest pulsation)	1 (0.5)
Facial coloration	1 (0.5)
Return of breathing	1 (0.5)
Spasms	1 (0.5)
Facial expression of pain	1 (0.5)
Release of sphincters	1 (0.5)
Arm movements	1 (0.5)

CPR: Cardiopulmonary Resuscitation. Soure: Created by the authors.

Table 6 – Descriptive analysis of the immediate conduct implemented and the rhythm found during PCR, among those who witnessed CPRIC (n = 200)

Conduct	n (%)
Pulse check	90 (45)
Suspended the massages	53 (26.5)
Continuation of CPR	40 (20.0)
Sedation	11 (5.5)
Patient immobilization	3 (1.5)
Oxygenation	1 (0.5)
Heart rate checked by defibrillator paddles	1 (0.5)
Rhythm	
VF	49 (24.5)
Pulseless VT	17 (8.5)
PEA	37 (18.5)
Asystole	30 (15.0)
Unknown (no monitoring at the time)	43 (21.5)
I don't remember	23 (11.5)

CPR: Cardiopulmonary resuscitation; VF: Ventricular fibrillation; VT: Ventricular tachycardia; PEA: Pulseless electrical activity. Source: Created by the authors.

Table 7 – Descriptive analysis of the presence at ROSC, along with patient's gender and age, when some of the signs of CPRIC were identified in patients among the professionals who witnessed the CPRIC (n = 200)

Characteristic	Answer	N % (frequency)
ROSC	Yes	128 (64.0)
	No	84 (42.0)
	I don´t know	28 (14.0)
Patient's gender	Male	143 (71.5)
	Female	28 (14.0)
	I don´t know	29 (14.5)
Patient's age	Child / Adolescent	9 (4.5)
	Adult	130 (65.0)
	Elderly	49 (24.5)
	I don´t know	12 (6.0)

ROSC: Return of Spontaneous Circulation. Source: Created by the authors.

Behaviors observed during CPR can raise several questions about awareness during CPR. In this study, the most observed behaviors included eye opening, attempts to interfere with resuscitation maneuvers, and psychomotor agitation, indicating some form of consciousness or brain activity. Additionally, moaning was another reported manifestation, suggesting possible vocal expression during CPR. Previous studies, such as West et al.,[15] explored cognitive activity during CPR, showing the perception of lucidity, visual and auditory awareness during CPR, in addition to reports of near-death experiences.[16] In this sense, the variety of behaviors reflects the wide range of individual experiences during CPR, highlighting the need for a deeper understanding and adaptive protocols.

In this study, the most common cardiac rhythms found during CPRIC were ventricular fibrillation (24.5%) and pulseless electrical activity (18.5%). In addition to these, the scientific literature also mentions pulseless ventricular tachycardia as a rhythm associated with CPRIC. A study by West et al.[15] suggests that the presence of CPRIC may be more common in cases of CPA with shockable rhythms, highlighting the importance of recognizing and treating these rhythms quickly in order to increase the chances of successful resuscitation and improve the prognosis of patients.

The procedures adopted for CPRIC varied among professionals, reflecting the lack of specific protocols on the subject. In the present study, the most common actions were checking the pulse, temporarily interrupting massages, and immediately continuing CPR. By contrast, the literature suggests other approaches, such as administering sedatives to alleviate possible discomfort in the conscious patient during CPR.[17] The lack of a standard among

the procedures adopted highlights the need for standardized guidelines for the management of CPRIC. Notably, 79.3% of the professionals surveyed believe that including CPRIC in current CPR guidelines is crucial.

As observed in the results, among the patients who presented signs of CPRIC, 64.0% had a ROSC, suggesting a possible association between the presence of CPRIC and favorable cerebral perfusion. However, the long-term implications of CPRIC for patients and rescuers are still uncertain. Studies, such as that of Dąbrowski et al.,[17] indicate that patients may develop cognitive sequelae, including post-traumatic stress disorder, after resuscitation. This raises concerns about the appropriate management of these situations due to the psychological and emotional impact of consciously experiencing CPR, both for the patient and for rescuers.

In this study, it was found that professionals are reluctant to use sedatives during CPA. The benefits of sedation in conscious patients during CPR are uncertain, and it is inappropriate to justify its use solely on the basis of the need for pain relief, considering that many CPA survivors report pleasant near-death experiences.[18] Factors against sedation include the difficulty in neurological assessment and the risk of circulatory depression.[9] However, since medications usually have a minimal effect on cardiac arrest outcomes, a small, controlled dose of sedation is unlikely to influence survival.[19,20] Studies have highlighted the importance of sedation and analgesia during CPR, emphasizing that medication should be carefully selected to support myocardial and cerebral blood flow. In addition, medications that are fast-acting, easy to administer, and reasonably priced should be chosen, despite the challenges inherent in this choice.[17,21]

One of the main gaps identified in this study is the lack of specific knowledge and training on CPRIC. Only 57.2% of the participants demonstrated prior knowledge on the topic, while 42.8% were unaware of the phenomenon. The lack of data in the literature on prior knowledge of CPRIC reinforces the need to include this topic in CPR guidelines of several medical societies, such as the American Heart Association, the European Society of Cardiology, and the Brazilian Society of Cardiology. Including CPRIC in these guidelines would contribute to greater awareness among professionals about this condition, promoting a more uniform and effective approach.

In addition, the lack of standardized protocols and the scarcity of information on the topic within current CPR guidelines highlight the need for action by health authorities. To mitigate this problem, it is suggested that continuing education programs be implemented that cover the topic of CPRIC, focusing on realistic simulations, case studies and group discussions. The creation of online platforms and specific teaching materials can also contribute to the dissemination of knowledge about CPRIC.

It is important to emphasize that this study has limitations that may influence the generalization of the results. Data collection carried out through an online questionnaire may have generated selection bias, mainly attracting professionals with greater interest in the topic of CPR and CPRIC. In addition, the concentration of the sample in the Southeast region (80.3%), to the detriment of the other regions (South, 8.9%; North and Northeast, 5.9%; and Midwest 4.9%) limits the national representativeness of the findings. The absence of a stratified sample by region compromises the ability to generalize the results to the entire Brazilian territory, since practices and perceptions may vary significantly between different regions. Finally, the self-reported nature of the collected data may be subject to memory and interpretation biases, affecting the accuracy of the information provided in this study.

Conclusion

This pioneering study in the Brazilian context investigated the knowledge and practice of health professionals regarding CPRIC, revealing a limited understanding and significant variability in the adopted procedures, especially in PHC. The identification of these gaps highlights the urgent need to update CPR guidelines, including specific guidance on the management of CPRIC.

The results obtained in this study, although subject to methodological limitations, provide important support for future research and for the implementation of more effective educational strategies. A deeper understanding of the pathophysiology of CPRIC, the assessment of the impact of the use of sedation and analgesia, and the investigation of the long-term consequences for patients are issues to be addressed in future research.

In summary, this study demonstrates the clinical relevance of CPRIC and the need for a more uniform and evidence-based approach to its management. The implementation of specific clinical protocols, associated with continuing education programs, can significantly contribute to improving the quality of care for patients experiencing CPRIC and to optimizing the results of CPR.

Author Contributions

Conception and design of the research: Arci MS; acquisition of data: Arci MS, Sá LMC, Oliveira LA, Agria GB; analysis and interpretation of the data: Arci MS, Sá LMC, Morinaga C; statistical analysis and tables: Morinaga C; writing of the manuscript: Arci MS, Sá LMC, Oliveira LA, Agria GB, Enohi RT; critical revision of the manuscript for intellectual contente and figures and tables: Arci MS, Sá LMC; preparation of the questionnaire: Oliveira LA.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any thesis or dissertation work.

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of the Universidade de Ribeirão Preto under the protocol number 7470.6423.7.000.5498. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013. Informed consent was obtained from all participants included in the study.

References

1. Silva PGMB, Macedo LS, Balada R, Geovanini GR, Bueno FS, Lopes RD. Update of Medical Care in Cardiorespiratory Arrest: What Should Every Clinician Know? Rev Soc Bras Clin Med. 2020;18(1):42-54.
2. Roma DS, Noronha LFP, Sasaki NSGMS. Parada Cardiorrespiratória (PCR): Revisão de Literatura. Revista Corpus Hippocraticum. 2017;1(1):1-8.
3. Doan TN, Adams L, Schultz BV, Bunting D, Parker L, Rashford S, et al. Insights into the Epidemiology of Cardiopulmonary Resuscitation-Induced Consciousness in Out-Of-Hospital Cardiac Arrest. Emerg Med Australas. 2020;32(5):769-76. doi: 10.1111/1742-6723.13505.
4. Nolan JP, Maconochie I, Soar J, Olasveengen TM, Greif R, Wyckoff MH, et al. Executive Summary: 2020 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Circulation. 2020;142(16 Suppl 1):2-27. doi: 10.1161/CIR.0000000000000890.
5. Santana KFS, Matos JHF, Formiga NPF, Santos MN, Gomes, EB, Silva LMS. Conduct in Consciousness with Cardiopulmonary Resuscitation: A Scoping Review. Res Soc Dev. 2022;11(10):e150111032455. doi: 10.33448/rsd-v11i10.32455.
6. American Heart Association. Highlights of the 2020 American Heart Association Guidelines for CPR and ECC [Internet]. Dallas: Texas; 2020 [cited 2025 Feb 13]. Available from: https://cpr.heart.org/-/media/CPR-Files/CPR-Guidelines-Files/Highlights/Hghlghts_2020_ECC_Guidelines_English.pdf.
7. Howard J, Lipscombe C, Beovich B, Shepherd M, Grusd E, Nudell NG, et al. Pre-Hospital Guidelines for CPR-Induced Consciousness (CPRIC): A Scoping Review. Resusc Plus. 2022;12:100335. doi: 10.1016/j.resplu.2022.100335.
8. Morais DA, Moura AD, Guelfi DCF, Moraes CMG, Machado GAC. Cardiopulmonary Resuscitation Induced Consciousness: Case Report. Int J Cardiovasc Sci. 2024;37:e20220023. doi:10.36660/ijcs.20220023.
9. Bihari S, Rajajee V. Prolonged Retention of Awareness During Cardiopulmonary Resuscitation for Asystolic Cardiac Arrest. Neurocrit Care. 2008;9(3):382-6. doi: 10.1007/s12028-008-9099-2.
10. Olaussen A, Nehme Z, Shepherd M, Jennings PA, Bernard S, Mitra B, et al. Consciousness Induced During Cardiopulmonary Resuscitation: An Observational Study. Resuscitation. 2017;113:44-50. doi: 10.1016/j.resuscitation.2017.01.018.
11. Fernandes JFGS, Cerqueira RA, Dratovsky HB, Clément L, Silva WP. Indução da Consciência Durante a Ressuscitação Cardiopulmonar. São Paulo: Associação Brasileira de Medicina de Emergência; 2020.
12. Cunningham LM, Mattu A, O'Connor RE, Brady WJ. Cardiopulmonary Resuscitation for Cardiac Arrest: The Importance of Uninterrupted Chest Compressions in Cardiac Arrest Resuscitation. Am J Emerg Med. 2012;30(8):1630-8. doi: 10.1016/j.ajem.2012.02.015.
13. Mentzelopoulos SD, Couper K, Voorde PV, Druwé P, Blom M, Perkins GD, et al. European Resuscitation Council Guidelines 2021: Ethics of Resuscitation and End of Life Decisions. Resuscitation. 2021;161:408-32. doi: 10.1016/j.resuscitation.2021.02.017.
14. R Core Team. R: A Language and Environment for Statistical Computing. Version 4.3.1 [Internet]. Vienna: The R Foundation; 2023 [cited 2025 Feb 13]. Available from: https://www.R-project.org/.
15. West RL, Otto Q, Drennan IR, Rudd S, Böttiger BW, Parnia S, et al. CPR-Related Cognitive Activity, Consciousness, Awareness and Recall, and its Management: A Scoping Review. Resusc Plus. 2022;10:100241. doi: 10.1016/j.resplu.2022.100241.
16. Greyson B. The Near-Death Experience Scale. Construction, Reliability, and Validity. J Nerv Ment Dis. 1983;171(6):369-75. doi: 10.1097/00005053-198306000-00007.
17. D□browski S, Lange S, Basi□ski A. Analgesic Use in Patients during Cardio-Pulmonary Resuscitation. Int J Environ Res Public Health. 2023;20(4):3654. doi: 10.3390/ijerph20043654.
18. Parnia S, Waller DG, Yeates R, Fenwick P. A Qualitative and Quantitative Study of the Incidence, Features and Aetiology of Near Death Experiences in Cardiac Arrest Survivors. Resuscitation. 2001;48(2):149-56. doi: 10.1016/s0300-9572(00)00328-2.
19. Nolan JP, Perkins GD. Is There a Role for Adrenaline during Cardiopulmonary Resuscitation? Curr Opin Crit Care. 2013;19(3):169-74. doi: 10.1097/MCC.0b013e328360ec51.
20. Olasveengen TM, Sunde K, Brunborg C, Thowsen J, Steen PA, Wik L. Intravenous Drug Administration during Out-Of-Hospital Cardiac Arrest: A Randomized Trial. JAMA. 2009;302(20):2222-9. doi: 10.1001/jama.2009.1729.
21. Rice DT, Nudell NG, Habrat DA, Smith JE, Ernest EV. CPR Induced Consciousness: Sedation Protocols for this Special Population. Br Paramed J. 2016;1(2): 24–9. doi: 10.29045/14784726.2016.1.2.24.