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SOCIOECONOMIC FACTORS ASSOCIATED WITH OUTCOME AFTER CARDIAC ARREST IN PATIENTS UNDER THE AGE OF 65

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Abstract

Aim—In a prior study of seven North American cities Pittsburgh had the highest crude rate of cardiac arrest deaths in patients 18 to 64 years of age, particularly in neighborhoods with lower socioeconomic status (SES). We hypothesized that lower SES, associated poor health behaviors (e.g., illicit drug use) and pre-existing comorbid conditions (grouped as socioeconomic factors [SE factors]) could affect the type and severity of cardiac arrest, thus outcomes.

Methods—We retrospectively identified patients aged 18 to 64 years treated for in-hospital (IHCA) and out-of hospital arrest (OHCA) at two Pittsburgh hospitals between January 2010 and July 2012. We abstracted data on baseline demographics and arrest characteristics like place of residence, insurance and employment status. Favorable cerebral performance category [CPC] (1 or 2) was our primary outcome. We examined the associations between SE factors, cardiac arrest variables and outcome as well as post-resuscitation care.

Results—Among 415 subjects who met inclusion criteria, unfavorable CPC were more common in patients who were unemployed, had a history of drug abuse or hypertension. In OHCA,

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All other authors declare that they have no conflict of interest.

favorable CPC was more often associated with presentation with ventricular fibrillation/tachycardia (OR 3.53, 95% CI 1.43-8.74, $p=0.006$) and less often associated with non-cardiovascular arrest etiology (OR 0.22, 95% CI 0.08-0.62, $p=0.004$). We found strong associations between specific SE factors and arrest factors associated with outcome in OHCA patients only. Significant differences in post-resuscitation care existed based on injury severity, not on SES.

Conclusions—SE factors strongly influence type and severity of OHCA but not IHCA resulting in an association with outcomes.

Keywords

cardiac arrest; young; socioeconomic position; outcome; survival

Introduction

Sudden cardiac arrest is a leading cause of death in the United States.¹ Every year, approximately 300,000 out-of-hospital cardiac arrests (OHCA)² and 200,000 in-hospital cardiac arrests (IHCA)³ occur in the US with an overall survival rate ranging from 8 to 22%.^{2,4,5} Socioeconomic status (SES) affects outcomes after cardiac arrest. The annual incidence of cardiac arrests is approximately two-fold higher in poor vs. wealthy neighborhoods across seven large North American regions.^{6,7} This discrepancy was most pronounced in patients 18 to 64 years of age with the lowest quartile household income⁷ suggesting that poorer SES may contribute to poorer health in this adult cohort, which does not qualify for universal health care programs like Medicare.⁷ Disparities in access to health care or differential delivery of services after admission could be influenced by lack of insurance or economic means which could impact outcomes after both IHCA and OHCA.

Lower SES may also be associated with other factors that would influence outcomes after OHCA but not IHCA. Drug abuse and obesity incidence is higher in areas with more poverty⁸, which could predispose to asphyxial OHCA (eg from drug overdose). Lower SES is often associated with lower employment and marriage rates.⁹ This could increase the likelihood of social isolation and delay activation of the chain-of-survival with lower rates of witnessed arrest and bystander cardiopulmonary resuscitation (CPR)¹⁰⁻¹² resulting in more severe brain injury and coma on presentation¹¹. Non-cardiac etiology of cardiac arrest, such as asphyxia from drug overdose, and higher rates of coma are both associated with worse outcomes after cardiac arrest¹³ suggesting an indirect means whereby socioeconomic factors (SE factors), which we define broadly as the sum of SES and associated behaviors and comorbidities, may alter outcomes after OHCA but not IHCA. On the other hand non-white race, also associated with lower SES^{6,7,14,15} has been linked to decreased survival post-arrest but this effect has been ascribed to differences in quality of care at the treating center.^{16,17}

The aim of this study was to describe the association between SE factors and outcomes of younger adults treated after cardiac arrest. We restricted the study to persons <65 years old reducing the likelihood these patients would have access to important social safety nets such as Medicare and social security. We hypothesized that SE factors may predispose patients to

more severe forms of OHCA (e.g. asphyxial) and greater brain injury (i.e. coma) thus indirectly influencing outcome after OHCA (**Figure 1**) but not IHCA. We also examined the association between SE factors and receipt of post-resuscitation care as an alternative hypothesis to explain potential outcome differences.

Methods

Patients

We analyzed data from all cardiac arrest patients 18-64 years of age who were admitted to UPMC Presbyterian Hospital and UPMC Mercy Hospital (Pittsburgh, PA, USA) between January 1, 2010 and July 30, 2012. Both hospitals are tertiary care centers staffed by academic physicians from the same emergency and critical care medicine departments. This study was approved by the University of Pittsburgh Institutional Review Board with waiver of informed consent due to the minimal risk. Patients with OHCA who have been pronounced dead in the field were not included into the study.

Data Abstraction

All IHCA and OHCA patients were identified from preexisting cardiac arrest quality improvement databases at the respective hospitals, which contained arrest characteristics, injury severity, post-resuscitation care data and outcomes data. Missing clinical, demographic and SES data were obtained by cross-linking the cardiac arrest database with individual electronic medical records. We abstracted the following information from patient charts: street address, zip code, race, insurance status, employment status (unemployed status included disabled subjects), marital status, religious status, first spoken language from the patients' admission demographics. Geocoding utilized the first two data elements to assign poverty index proportions for each patient's location of residence as a surrogate for poverty/income.

The cause of cardiac arrest was determined by reviewing every single patient chart and looking for the admission and discharge notes. Cause of the cardiac arrest was assigned by the team caring for the patient. Furthermore, admission notes were reviewed for additional behaviors, which impact health such as any prior history of drug abuse and positive urine drug screen (UDS) indicating higher likelihood of active drug abuse. For UDS we confirmed that the drug present on the drug screen was not given by clinicians as part of clinical care. Comorbidity variables obtained from medical histories included smoking status (coded as smoker if actively smoking within 6 months of CA), preexisting hypertension, diabetes, hyperlipidemia, coronary artery disease (CAD) and stroke. We calculated body mass index (BMI) from height and weight data during that admission.¹⁸

The cardiac arrest quality improvement databases contained information regarding initial cardiac arrest rhythm, location of arrest, use of induced hypothermia, illness severity, and outcomes. Severity of post-arrest illness was classified using the Pittsburgh Cardiac Arrest Category (PCAC),¹⁹⁻²¹ which combines subscales of the early Sequential Organ Failure Assessment (SOFA) score²² and neurologic evaluation to stratify patients into categories I-IV with descending expected survival. We recorded the performance of coronary

angiography, induced therapeutic hypothermia and hospital length of stay as metrics of post-resuscitation care. We dichotomized two cardiac arrest factors associated with outcome: initial cardiac arrest rhythm of ventricular fibrillation (VF) or pulseless ventricular tachycardia (VT) and non-cardiac etiology of arrest.

Outcomes

Outcomes assessed were discharge cerebral performance category (CPC)²³ and survival to hospital discharge. A CPC score of 1 (good function) or 2 (moderate disability) was considered favorable; the remaining categories were 3 (severe disability), 4 (a vegetative state), and 5 (death) and were considered unfavorable. CPC was determined at hospital discharge via chart review using a standard algorithm.²⁴ Patients with favorable CPC have sufficient cerebral function to live independently and work at least part-time.²⁴ Since favorable CPC incorporates survival and functional outcomes we used it as our primary analysis outcome.

Software and Statistical Analysis

We geocoded patient addresses and depicted these in a map of the region using commercially available geographic information system software (ArcGIS 10.1, Esri, Redlands, CA, USA). Similarly, poverty status (defined as proportion of people living below the poverty threshold) at the census tract level was obtained from 2011 American Community Survey (ACS) data, color coded into 4 groups, and depicted in the same maps. Classification of patients on the basis of the proportion of people living below the poverty line within their census tract was our primary surrogate for economic status. In analyses we compared patients living in <10% poverty (relatively affluent) to those living in >16% poverty (relatively poor) based on the average U.S. national poverty level of 16%.

We analyzed all data with a commercially available statistical software package (Stata SE Version 13.1, StataCorp LP, College Station, Texas, USA). Continuous data were compared using Wilcoxon rank sum tests and are presented as means with standard deviations or median with inter-quartile ranges (IQR) if not normally distributed. We compared categorical data between groups using chi square test and Fisher's exact test. Univariate logistic regression was used to determine the degree of association between socioeconomic variables and cardiac arrest factors with outcomes. We included all variables with unadjusted association p-value <0.20 in a backward stepwise multivariable logistic regression to examine adjusted association with outcomes. Due to missing variables in the data fields, we excluded BMI from our multivariate analysis. Separate regressions were performed for IHCA and OHCA based on the hypotheses described above. A *P*-value < 0.05 was considered statistically significant. Goodness of fit of multivariable models was tested using Hosmer-Lemeshow statistic. Similar methodology was employed in the additional multivariable analyses described below. As recommended for exploratory studies, we did not adjust for multiple comparisons to avoid missing important associations for future studies.²⁵

To test the first part of our hypothetical model (**Figure 1**) that SE factors were independently associated with cardiac arrest factors, we employed a multivariable backward stepwise logistic regression using the 2 dichotomized cardiac arrest factors (VF/VT and non-cardiac

etiology of arrest) as the dependent variable. Likewise to test the hypothesis that SE factors were independently associated with injury severity, we employed a multivariable backward stepwise logistic regression using unfavorable PCAC (IV) vs. favorable PCAC (I) as the dependent variable.

Results

Patient Characteristics

Of 733 subjects treated at UPMC Presbyterian and Mercy hospitals after cardiac arrest during the study period, we excluded 318 (43.4%) based on pre-specified age criteria leaving 415 (56.6%) in the final cohort (Presbyterian 320 patients, Mercy 95 patients, supplement **Table 1**). Cardiac arrest patients at UPMC Mercy were more likely to be black, unmarried, uninsured or on Medicare/Medicaid, more likely not to have a next of kin named and/or to be overweight based on higher mean BMI. The 2 centers served substantially different populations from a socioeconomic standpoint but CPC and survival were similar (**Supplement Table 2**).

Of the 415 subjects, 134 (32.3%) had a shockable rhythm (i.e. VF or pulseless VT) documented as the first rhythm, 273 subjects (65.8%) had a non-shockable rhythm (i.e. asystole or pulseless electrical activity) and 8 subjects (1.9%) had no documented initial rhythm. OHCA subjects were more likely to have a shockable rhythm compared to IHCA subjects (37.1 vs. 25.0%, $P=0.013$). Induced hypothermia was applied in 229 cases (55.2%), which is 90.9% of cases with PCAC 2-4 (coma). Cardiac etiology cardiac arrests were most common in this cohort followed by asphyxial arrest due to respiratory illness and drug overdose (**Figure 2**). A history of active drug abuse was reported in 87 subjects (21%). In 79 cases (19.0%) a drug of abuse was identified on UDS and ethanol was detected in six instances. Opiates were the most frequently identified illicit drug (37/79 [46.8%]). Drug overdose as an assumed cause of death occurred in 50 subjects (12%) and was the third most common cause of arrest (**Figure 2**).

Socioeconomic factors, post-resuscitation care and injury severity

We compared SE factors within the full cohort (n=415) based on a favorable (n=77) or unfavorable (n=338) CPC (**Table 1**). Subjects with favorable CPC were more likely to be employed, to identify a next of kin, to be white, to have a history of smoking, hypertension and CAD and were less likely to have a history of substance abuse. Insurance status and marital status did not differ between groups. Out of 384 subjects living in Pennsylvania prior to arrest, 315 (82%) could be geocoded. From these, 122 (38.7%) lived in neighborhoods with low poverty levels (<10%) whereas 151 (47.8%) lived in neighborhoods with a poverty level >16% (**Supplement Figure 1**) but the distribution of favorable vs unfavorable CPC was similar. A history of drug abuse, a positive UDS and an unemployed/disabled status were independently associated with lower likelihood of favorable CPC in OHCA but not in IHCA. Smoking, hyperlipidemia and CAD were associated with a higher likelihood of favorable CPC in OHCA (**Table 2**).

We noted significant differences in post-resuscitation care based on injury severity. Compared to our most injured patients (PCAC IV), the least injured patients (PCAC I) were more likely to receive coronary angiography, have longer length of stay and less likely to receive induced hypothermia (all $p < 0.001$). This was true in both IHCA and OHCA with the exception of coronary angiography (not performed after IHCA). Higher injury severity was independently associated with non-cardiac etiology of arrest and the use of induced hypothermia.

Cardiac arrest, socioeconomic status, and outcomes

Survival to hospital discharge occurred in 166/415 patients (40.0%), with favorable CPC in 77/415 (18.6%). Favorable CPC was more common in patients having cardiac etiology cardiac arrest and those presenting with VF/VT (**Table 3**). Non-cardiac etiology of cardiac arrest was associated with lower odds of favorable CPC in unadjusted analyses of both IHCA (OR 0.38, 95% CI 0.17-0.87, $p = 0.02$) and OHCA (OR 0.13, 95% CI 0.05-0.29, $p < 0.001$). VF/VT as a presenting rhythm was associated with higher odds of favorable CPC in OHCA only (OR 7.19, 95% CI 3.49-14.82, $p < 0.001$), although a strong similar trend was noted in IHCA. We examined the association between SE factors and cardiac arrest factors together in one model with outcome. In IHCA, non-cardiac etiology was associated with unfavorable outcome. In OHCA, VF/VT was associated with favorable outcome and non-cardiac etiology of arrest with unfavorable outcome (**Figure 3**). In both instances, Hosmer-Lemeshow test statistics suggested adequate goodness of fit ($P = 0.58$ for IHCA and $P = 0.83$ for OHCA).

Thus the more proximate cardiac arrest factors dominated in their association with outcomes over SE factors which had significant associations with OHCA outcomes only in unadjusted analyses.

We examined the independent association between SE factors and cardiac arrest factors using multivariable regression. In IHCA, smoking and a history of CAD were associated with lower likelihood of non-cardiac etiology arrest (ie higher likelihood of cardiac etiology arrest). In OHCA, drug use (positive UDS) and unemployment were strongly associated with non-cardiac etiology of arrest and unemployment was associated with lower odds of presenting with VF/VT. Smoking was associated with higher odds of VF/VT presentation and a history of hypertension or coronary artery disease were associated with a higher odds of cardiac etiology arrest (**Supplement Table 3**).

Discussion

In our two center study, our principle findings are that a high fraction of patients treated after cardiac arrest have markers of low SES, pre-existing comorbidities and engage in unhealthy behaviors such as drug abuse. Many of these SE factors were associated with outcomes after OHCA (not IHCA) in unadjusted analyses, but in the final adjusted multivariable models the cardiac arrest factors (etiology, presenting rhythm and coma marked by hypothermia) dominated. Further analysis showed a number of strong associations between SE factors and these cardiac arrest factors in the OHCA subset only.

Our findings regarding the strong association between cardiac arrest factors and outcome are not surprising and are noted previously. Presenting with VF/VT is a predictor of good outcome.⁵ Non-cardiac etiology arrests, which tend to be non-VF/VT arrests, were associated with unfavorable outcomes in our study and elsewhere¹³ though not as often as the VF/VT association. The association between induced hypothermia and worsened outcomes²⁴ in a retrospective study is known and reflects its non-random application only to more severely brain injured comatose patients. The association between smoking and favorable outcomes has been reported previously, and has been postulated to reflect preconditioning as a result of low level carbon monoxide exposure.²⁶ An alternative possibility is that smoking results in CAD making smokers more likely to have cardiac etiology arrest which is associated with better outcomes.

One of the most interesting findings (**Figure 1**) was that these cardiac arrest factors which appear to consistently define outcome are strongly associated with a number of SE factors in OHCA but not IHCA implying an indirect means whereby SES may influence outcome after OHCA. This disparity between IHCA and OHCA is indeed confirmatory of our hypothesis as one would only expect behaviors such as drug abuse or social isolation due to unemployment to impact outcomes in the community but not hospital setting. In OHCA, the ability of certain SE factors such as drug abuse to alter the type of cardiac arrest, favoring non-cardiac etiology and non-VF/VT presentation may result in more brain injury, confirmed by the association with induced hypothermia, and worsened outcomes.

A significant proportion of our patients had either a past history of illicit drug use or a positive UDS on admission. We noted a strong association between historical or active drug abuse and asphyxial arrest, which tends to present with rhythms that are non-shockable and more often result in coma. The last association may be the frequency with which these arrests are unwitnessed or witnessed by persons unwilling to report them in a timely fashion thus increasing the ischemic time and brain injury.^{27,28} Given the socioeconomic disparities in drug abuse, this finding appears to account for much of the indirect effect of SE factors on outcomes and identifies an important potential target for public health interventions.

Poverty is strongly associated with race, and some researchers argue that racial health disparities are entirely explained by differences in SES.²⁹⁻³¹ Unlike prior reports¹⁶, we did not see any differences in race and outcome in our two-hospital cohort. We have the benefit of having two centers within close proximity, which serve different populations but produce similar high quality outcomes. In our OHCA patients, we did not have any data on bystander CPR. From previous studies it is known that in adolescents, bystander CPR is linked to the parental educational level.³² also, there could potentially be areas with a high incidence of OHCA and a low prevalence of bystander CPR.^{33,34}, which we could not address.

A reassuring finding in our study was that within these two centers, post-resuscitation care does not appear to be guided by SE factors but rather injury severity. Clearly in cases where SE factors influence injury severity there could be an indirect link but there is little within our findings to support the notion of discrimination or differential care on the basis of socioeconomic disparities. Center specific differences, which may be explained by the absence of in-house fellows at Mercy vs. Presbyterian, do seem to impact the use of

coronary angiography and in our study these differences appear to account for the differential use of coronary angiography on the basis of employment status.

Limitations

There are several limitations in this study. Our retrospective study design limits the ability to assign cause and effect, and our limited sampling region only drew from two centers in Pittsburgh. This limits generalizability and underscores the need for validation. We were limited in the data available to us in the electronic medical record. Thus census tract (mean income by residence) was used as a surrogate for individual income which could result in misclassification and we did not have access to education level, an important component of SES. Our analysis was limited to patients admitted to the hospital, 60.5% with out-of-hospital cardiac arrest. Thus, it is plausible that patients who had field efforts terminated might have had different SE factors. Additional limitations include missing variables in the data fields representing BMI which excluded this variable from our multivariate analysis. Nonetheless sensitivity analyses including these factors did not alter our results. Missing addresses and employment status (~25%) which may not have been missing at random, also limit our analysis.

Conclusion

Our results suggest that in-hospital outcomes after cardiac arrest are not directly influenced by preexisting comorbid conditions, poor health behaviors and lower SES. Some of these factors such as smoking and drug abuse may indirectly influence outcomes by modifying the type and severity of cardiac arrest. This indirect effect applies primarily to OHCA and we did not see differences in post-resuscitation care based on SE factors.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

Hypothetical model of interplay between socioeconomic factors and cardiac arrest outcomes in out-of-hospital cardiac arrest. Socioeconomic factors such as individual socioeconomic status (eg living in a poor neighborhood), behaviors (eg drug abuse) and comorbidities (eg hypertension) interact with one another in a complex interplay which then appears to be strongly associated with cardiac arrest factors such as presenting rhythm and etiology of arrest. These proximate cardiac arrest factors in turn are the powerful determinants of outcomes in this and other studies.

Figure 2.

The etiology of cardiac arrest for the overall population (n=415), IHCA (in-hospital cardiac arrest) and OHCA (out-of-hospital cardiac arrest) patients is described.

Figure 3.

Factors independently associated with favorable CPC. The results of the final multivariate regressions are reported for CPC of **A)** IHCA (n=156) and **B)** OHCA (n=234). In both models displayed, a non-cardiac etiology of arrest was independently associated with unfavorable CPC. Furthermore, in OHCA, the use of induced hypothermia was associated with an unfavorable CPC, while a presentation with VF/VT was associated with favorable CPC (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$)

Abbreviations: VF/VT: ventricular fibrillation/ pulseless ventricular tachycardia; NOK: Next of kin; CPC: Cerebral performance category.

Table 1

Distribution of socioeconomic factors by outcome

Characteristics	Overall	Favorable outcome (CPC 1-2)	Unfavorable outcome (CPC 3-5)	p value
<u>Insurance status</u>	415	77	338	
No insurance	51 (12.3%)	13 (16.9%)	38 (11.2%)	0.17
Medicare	66 (15.9%)	10 (13.0%)	56 (16.6%)	0.49
Medicaid	68 (16.4%)	8 (10.4%)	60 (17.8%)	0.13
Insurance	230(55.4%)	45 (58.4%)	185 (54.7%)	0.61
<u>Employment status</u>				
Employed	65 (15.7%)	20 (26.0%)	45 (13.3%)	0.009
Unemployed	190 (45.8%)	28 (36.4%)	162 (47.9%)	0.08
Disabled	41 (9.9%)	9 (11.7%)	32 (9.5%)	0.53
Retired	13 (3.1%)	0 (0%)	13 (3.8%)	0.14
Unknown work status	105 (25.3%)	19 (24.7%)	86 (25.4%)	1.0
<u>Others</u>				
No religious denomination	85 (20.5%)	20 (26.0%)	65 (19.2%)	0.19
No Next of Kin	28 (6.7%)	1 (1.3%)	27 (8.0%)	0.04
<u>Race</u>	359	72	287	
Nonwhite race	54 (15.0%)	6 (8.3%)	48 (16.7%)	0.08
<u>Residence status</u>	315	59	256	
Residence >16% poverty threshold	134 (42.5%)	25 (42.4%)	109 (42.6%)	0.98
<u>Marital status</u>	366	71	295	
Unmarried	230(62.8%)	40 (56.3%)	190 (64.4%)	0.21
Age, mean (SD); 415	50 (12)	50 (12)	50 (12)	0.93
Weight in kg, mean (SD); 396	90 (30)	95 (33)	89 (29)	0.10
BMI in kg/m ² , mean (SD); 319	30 (10)	31 (13)	30 (10)	0.32
<u>Comorbidities</u>	415	77	338	
Hypertension	211 (50.8%)	48 (62.3%)	163 (48.2%)	0.03
Hyperlipidemia	119 (28.7%)	29 (37.7%)	90 (26.6%)	0.05
CAD	82 (19.8%)	21(27.3%)	61 (18.0%)	0.07
Diabetes	115 (27.7%)	17 (22.1%)	98 (29.0%)	0.22
Stroke	24 (5.8%)	2 (2.6%)	22 (6.5%)	0.19
OHCA	251 (60.5%)	47 (61.0%)	204 (60.4%)	0.91
IHCA	164 (39.5%)	30 (39%)	134 (39.6%)	0.91
History of drug abuse	87 (21.0%)	9 (11.8%)	78 (23.0%)	0.03
Drug test positive	79 (19.0%)	10 (13.2%)	69 (20.4%)	0.19
Smoking	161 (38.8%)	41 (53.2%)	120 (35.5%)	0.004

Abbreviations: BMI: body mass index; VF/VT: Ventricular fibrillation / ventricular tachycardia; CAD: coronary artery disease; OHCA: out-of hospital cardiac arrest

Table 2

Unadjusted associations between socioeconomic factors and favorable CPC

	IHCA		OHCA	
	OR	p-value	OR	p-value
History of drug abuse	0.76 (0.21-2.80)	0.69	0.34 (0.14-0.85)	0.02
Urine drug screen positive	1.72 (0.51-5.83)	0.38	0.35 (0.14-0.87)	0.02
Unemployment/disabled	1.04 (0.35-3.11)	0.94	0.39 (0.18-0.84)	0.02
Nonwhite race	0.78 (0.27-2.23)	0.64	0.15 (0.02-1.15)	0.07
Unmarried	0.88 (0.39-2.01)	0.76	0.62 (0.31-1.22)	0.16
No insurance	2.33 (0.80-7.63)-	0.12	(0.51-3.10)	0.63
No religious denomination	1.51 (0.60-3.77)	0.38	1.45 (0.69-3.05)	0.33
Poverty >16%	0.99 (0.38-2.53)	0.98	1.01 (0.48-2.10)	0.98
Smoking	2.11 (0.95-4.72)	0.07	2.04 (1.08-3.88)	0.03
Hypertension	1.80 (0.75-4.34)	0.19	1.84 (0.97-3.49)	0.06
Hyperlipidemia	0.87 (0.38-2.00)	0.74	2.70 (1.37-5.30)	0.004
Non-Cardiac etiology	0.38 (0.17-0.87)	0.02	0.13 (0.05-0.29)	<0.001
CAD	1.01 (0.40-2.58)	0.981	2.46 (1.18-5.13)	0.02
Stroke	0.27 (0.35-2.16)	0.22	0.61 (0.07-5.10)	0.65
Diabetes	0.38 (0.15-1.00)	0.05	1.08 (0.51-2.30)	0.84

Abbreviations: IHCA: in hospital cardiac arrest; OHCA: out of hospital cardiac arrest; CAD: coronary artery disease;

Table 3

Distribution of cardiac arrest factors between favorable and unfavorable CPC

Etiology	Overall (n=415)	Favorable CPC (n=77)	Unfavorable CPC (n=338)	P value
Cardiac	182 (43.9%)	57 (74.0%)	125 (37.0%)	<0.001
Non-cardiac	212 (51.1%)	19 (24.7%)	193 (57.1%)	<0.001
Asphyxial (resp. and intoxication)	160 (38.6%)	18 (23.4%)	142 (42.0%)	0.003
Other causes	52 (12.5%)	1 (1.3%)	51 (15.1%)	<0.001
Unknown	21 (5.1%)	1 (1.3%)	20 (5.9%)	0.15
Presenting Rhythm VF/VT	134 (32.3%)	47 (61.0%)	87 (25.7%)	<0.001

Other causes include cerebral, hemorrhagic shock, anaphylactic shock, trauma, sepsis, drowning, accidental hypothermia, hanging injury, electrolyte disorder