Pediatric Out-of-Hospital Cardiac Arrest Characteristics and Their Association With Survival and Neurobehavioral Outcome*

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***See also p. 1190.**

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Additional members of the Therapeutic Hypothermia after Pediatric Cardiac Arrest (THAPCA) Trial Investigators are listed in **Appendix 1** (Supplemental Digital Content 2, http://links.lww.com/PCC/A344).

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Objective: To investigate relationships between cardiac arrest characteristics and survival and neurobehavioral outcome among children recruited to the Therapeutic Hypothermia after Pediatric Cardiac Arrest Out-of-Hospital trial.

Design: Secondary analysis of Therapeutic Hypothermia after Pediatric Cardiac Arrest Out-of-Hospital trial data.

Setting: Thirty-six PICUs in the United States and Canada.

Patients: All children (n = 295) had chest compressions for greater than or equal to 2 minutes, were comatose, and required mechanical ventilation after return of circulation.

Interventions: Neurobehavioral function was assessed using the Vineland Adaptive Behavior Scales, Second Edition at baseline (reflecting prearrest status) and 12 months postarrest. U.S. norms for Vineland Adaptive Behavior Scales, Second Edition scores are 100 (mean) ± 15 (SD). Higher scores indicate better functioning. Outcomes included 12-month survival and 12-month survival with Vineland Adaptive Behavior Scales, Second Edition greater than or equal to 70.

Measurement and Main Results: Cardiac etiology of arrest, initial arrest rhythm of ventricular fibrillation/tachycardia, shorter duration of chest compressions, compressions not required at hospital arrival, fewer epinephrine doses, and witnessed arrest were associated with greater 12-month survival and 12-month survival with Vineland Adaptive Behavior Scales, Second Edition greater than or equal to 70. Weekend arrest was associated with lower 12-month survival. Body habitus was associated with 12-month survival with Vineland Adaptive Behavior Scales, Second Edition greater than or equal to 70; underweight children had better outcomes, and obese children had worse outcomes. On multivariate analysis, acute life threatening event/sudden unexpected infant death, chest compressions more than 30 minutes, and weekend arrest were associated with lower 12-month survival; witnessed arrest was associated with greater 12-month survival. Acute life

threatening event/sudden unexpected infant death, other respiratory causes of arrest except drowning, other/unknown causes of arrest, and compressions more than 30 minutes were associated with lower 12-month survival with Vineland Adaptive Behavior Scales, Second Edition greater than or equal to 70.

Conclusions: Many factors are associated with survival and neurobehavioral outcome among children who are comatose and require mechanical ventilation after out-of-hospital cardiac arrest. These factors may be useful for identifying children at risk for poor outcomes, and for improving prevention and resuscitation strategies. (*Pediatr Crit Care Med* 2016; 17:e543–e550)

Key Words: cardiac arrest; cardiopulmonary resuscitation; children; infants; neurobehavioral outcome

Reports from various regions around the world have begun to describe the epidemiology of pediatric out-of-hospital cardiac arrest (OHCA) (1–15). Annual occurrence rates are about 7–8 per 100,000 children with some variation based on the time and location of the study. Cardiac arrest characteristics, survival rates, neurologic outcomes, and factors associated with outcomes after pediatric OHCA also vary depending on the population studied, definitions of variables, and data sources. Limitations of many existing studies include the lack of long-term follow-up, and the use of subjective neurologic outcome measures. Objective longitudinal outcome assessments would strengthen the evidence relating cardiac arrest characteristics to outcomes, as well as the clinical implications derived from such evidence.

The Therapeutic Hypothermia after Pediatric Cardiac Arrest Out-of-Hospital (THAPCA-OH) trial was a randomized trial comparing the efficacy of therapeutic hypothermia with that of therapeutic normothermia on survival with good neurobehavioral outcome in children 1 year after OHCA (ClinicalTrials.gov number, NCT00878644) (16). All children recruited to the THAPCA-OH trial were comatose, required mechanical ventilation after return of circulation (ROC), and were at high risk for neurologic disability. Neurobehavioral function was assessed longitudinally in the THAPCA-OH trial using the Vineland Adaptive Behavior Scales, Second Edition (VABS-II) (17). Results of the trial showed that neither treatment arm conferred a significant benefit in survival with good neurobehavioral outcome. Although children in the THAPCA-OH trial represent a select population of children with OHCA, the well-defined longitudinal outcome assessments made during the trial allow for precise investigation of relationships between cardiac arrest characteristics and outcomes. These children also represent the population in which identification of such relationships may be most useful to bedside clinicians counseling families. This study investigates relationships between child and arrest characteristics, and survival and neurobehavioral outcome among children recruited to the THAPCA-OH trial.

METHODS

Design and Setting

The study is a secondary analysis of data from the THAPCA-OH trial (16). The trial was conducted in 36 PICUs in the United states and Canada from September 1, 2009, to December 31, 2012. Details of the trial were previously published (16, 18–20). The study was approved by the institutional review boards at all sites and the Data Coordinating Center. Parental permission was obtained for all participants.

Participants

Children eligible for the THAPCA-OH trial were greater than 48 hours and less than 18 years old, had an OHCA with chest compressions for greater than or equal to 2 minutes, and required mechanical ventilation after ROC. Exclusion criteria were previously published (16, 18). A total of 295 children were randomized.

Data Collection

Data were collected by research coordinators at the time of study entry by medical record review and direct interaction with parents and clinicians. Data included child demographics, preexisting conditions, body habitus, primary etiology of arrest, initial arrest rhythm, estimated duration of chest compressions, whether chest compressions were required on hospital arrival, number of doses of epinephrine administered during the arrest, whether the arrest was witnessed and/or bystander compressions performed, time of arrest, and the earliest pH, glucose, and lactate concentrations recorded postarrest but prior to the study intervention.

Child demographics included age, gender, race, and ethnicity. Age was categorized as less than 1, 1–4, 5–12, and greater than or equal to 13 years old. Preexisting conditions included respiratory, cardiac, neurologic, gastrointestinal, prenatal, and other conditions. Body habitus was assessed using body mass index-for-age (BMI-for-age) percentiles for children 2 years old or older, and weight-for-length percentiles for children less than 2 years old. BMI-for-age and weight-for-length percentiles were determined using the child's age, gender, weight and length and resources from the U.S. Centers for Disease Control and Prevention (21). In cases where actual length was not available ($n = 31$), the median length-for-age adjusted for gender was used to determine the BMI-for-age or weight-for-length percentile. Children were categorized as obese if their BMI-for-age or weight-for-length was greater than or equal to 95th percentile and underweight if less than fifth percentile.

Primary etiology of arrest was categorized as cardiac, respiratory, or other/unknown; respiratory etiology was subcategorized as acute life threatening event (ALTE)/sudden unexpected infant death (SUID), drowning, or other respiratory cause. Initial arrest rhythm was the first rhythm documented during the arrest and was categorized as asystole, bradycardia, pulseless electrical activity, ventricular fibrillation/tachycardia (VF/VT), or unknown. Time of arrest was defined as time of ROC and categorized as daytime or nighttime and weekday or weekend. Daytime was defined as 7:00 AM to 6:59 PM and nighttime as 7:00 PM to 6:59 AM. Weekday was defined as Monday 12:00 AM to Friday 11:59 PM and weekend as Saturday 12:00 AM to Sunday 11:59 PM.

Outcomes included 12-month survival and 12-month survival with good neurobehavioral function. Neurobehavioral function was assessed using the VABS-II (17). The VABS-II is a caregiver report measure of adaptive behavior from birth to adulthood. Adaptive behavior is defined as performance on

daily life activities necessary for personal and social independence. The VABS-II domains include communication, daily living, socialization, and motor skills. The number of tasks that can be performed in each domain is standardized for the child's age. In normative U.S. populations, the mean VABS-II score is 100, and the SD is 15. Higher scores indicate better functioning.

Baseline VABS-II assessments were completed with parents at the sites within 24 hours of randomization in the THAPCA-OH trial. Research coordinators assisted parents with the baseline VABS-II which reflected prearrest status. Twelve-month VABS-II assessments were completed with parents over the telephone by interviewers from the Kennedy Krieger Institute. Twelve-month survival with good neurobehavioral function was defined as 12-month survival with VABS-II greater than or equal to 70.

Statistical Analyses

Child and arrest characteristics were summarized using frequencies and percentages for categorical variables and medians and quartiles for quantitative variables. Univariate associations between these characteristics and outcomes were examined using the chi-square test of no association or the Cochran-Armitage test for trend. In these associations, categories of "unknown" were included in the analysis only for the primary etiology of arrest and the initial arrest rhythm. For the outcomes of 12-month survival and 12-month survival with VABS-II greater than or equal to 70, logistic regression models were used to estimate odds ratios and 95% CIs. For these models, the characteristics that had a univariate p value less than 0.1 were entered into the model using backward selection and only those with a p value of less than 0.05 were retained in the final model. Laboratory values were not included in the models due to high rates of missing data. Hosmer-Lemeshow tests were used to evaluate overall goodness of fit of the models. All analyses were completed using SAS software v9.4 (SAS Institute, Inc., Cary, NC).

RESULTS

Overall, 196 children (66.4%) were male, 176 (59.7%) were white, and 112 (38.0%) were less than 1 year old (**Table 1**). One hundred and forty-three children (48.5%) had at least one preexisting condition; of these, 67 (46.9%) had a preexisting respiratory condition, 49 (34.3%) neurologic, 39 (27.3%) cardiac, 41 (28.7%) gastrointestinal, 37 (25.9%) prenatal, and 64 (44.8%) another condition. Sixty-three children (21.4%) were obese and 47 (15.9%) were underweight. Median baseline (prearrest) VABS-II scores were 99 (86–109) (n = 269).

Primary etiology of OHCA was respiratory for 213 children (72.2%), cardiac for 37 (12.5%), and other/unknown for 45 (15.3%) (**Table 2**). Initial arrest rhythm was asystole for 172 children (58.3%). One hundred and eight children (36.6%) received chest compressions for more than 30 minutes and 197 (66.8%) received chest compressions on hospital arrival. Median number of epinephrine doses was 3 (2–5). Cardiac arrest was witnessed for 109 children (36.9%), and bystander compressions were performed for 186 (63.1%). Arrests occurred during the day for 205 children (69.5%) and on weekdays for 214 (72.5%). Postarrest laboratory values showed a median blood pH of 7.2 (7.1–7.3), glucose 246 mg/dL (176–318 mg/dL) (13.7 mmol/L [9.8–17.6 mmol/L]), and lactate 7.1 mmol/L (3.5–11.1 mmol/L).

Age was associated with 12-month survival and 12-month survival with VABS-II greater than or equal to 70 (Table 1). Children less than 1 year old had the lowest survival. Children less than 1 and 5–12 years old were less likely to survive with VABS-II greater than or equal to 70. Presence of a preexisting condition was associated with greater 12-month survival. Body habitus was associated with 12-month survival with VABS-II greater than or equal to 70; underweight children had better outcomes, whereas obese children had worse outcomes.

Cardiac etiology of arrest, initial arrest rhythm VF/VT, shorter duration of chest compressions, chest compressions not required at hospital arrival, fewer epinephrine doses, and witnessed arrest were associated with greater 12-month survival and greater 12-month survival with VABS-II greater than or equal to 70 (Table 2). Weekend arrest was associated with lower 12-month survival. Bystander compressions were not associated with these outcomes.

Blood pH was associated with 12-month survival; children with pH less than 7 had the lowest survival (**Supplemental Table 1**, Supplemental Digital Content 1, http://links.lww.com/PCC/A315). Blood glucose and lactate concentrations were associated with 12-month survival and 12-month survival with VABS-II greater than or equal to 70. Children with blood glucose greater than or equal to 350 mg/dL (19.4 mmol/L) and/or lactate greater than or equal to 10 mmol/L had worse outcomes.

Logistic regression models are shown in **Table 3**. Etiology of arrest ALTE/SUID, chest compressions more than 30 minutes, and weekend arrest were associated with lower 12-month survival. Witnessed arrest was associated with greater 12-month survival. Etiology of arrest ALTE/SUID, other respiratory causes except drowning, other/unknown causes of arrest, and chest compressions more than 30 minutes were associated with lower 12-month survival with VABS-II greater than or equal to 70.

DISCUSSION

Our study identified several child and arrest characteristics that are associated with survival and objective measurement of neurobehavioral function in children 12 months post-OHCA. Some of these variables have been associated with short-term survival and less rigorous neurologic outcome assessments in prior research. In our study, the use of the VABS-II (17) to quantify neurobehavioral function longitudinally strengthens the evidence supporting associations between child and arrest characteristics and outcomes, and provides greater insight into the extent of disability these children experience.

Child characteristics associated with survival and neurobehavioral function in our study included age and the presence of preexisting conditions. Others have similarly reported age less than 1 year to be associated with decreased survival after OHCA (4, 10, 12, 22). Low survival may be due to the high proportion of infant arrests that are unwitnessed and related to ALTE/SUID (10). Infants with ALTE/SUID may have a prolonged period of no blood flow before cardiac arrest is realized by caregivers contributing to poor outcomes. Preexisting conditions were present in almost half of the children in our study, and respiratory

TABLE 1. Child Characteristics and Associations With Outcomes

Characteristic	Overall, *n* (%)	Survived to 12 Mo, *n* (%)	*p*[a]	Survived to 12 Mo With Vineland Adaptive Behavior Scales, Second Edition ≥ 70, *n* (%)	*p*[a]
Total	295	96/287 (33.4)		42/260 (16.2)	
Age in years			< 0.001		0.004
< 1	112 (38.0)	21/108 (19.4)		8/101 (7.9)	
1–4	94 (31.9)	38/91 (41.8)		20/78 (25.6)	
5–12	44 (14.9)	15/43 (34.9)		4/40 (10.0)	
> 13	45 (15.3)	22/45 (48.9)		10/41 (24.4)	
Sex			0.240		0.534
Male	196 (66.4)	68/190 (35.8)		30/175 (17.1)	
Female	99 (33.6)	28/97 (28.9)		12/85 (14.1)	
Race			0.678		0.529
Asian	11 (3.7)	2/9 (22.2)		2/9 (22.2)	
Black or African American	65 (22.0)	25/65 (38.5)		6/58 (10.3)	
White	176 (59.7)	55/171 (32.2)		28/159 (17.6)	
Other	14 (4.7)	4/14 (28.6)		3/14 (21.4)	
Unknown	29 (9.8)	10/28 (35.7)		3/20 (15.0)	
Ethnicity			0.809		0.600
Hispanic or Latino	65 (22.0)	21/64 (32.8)		10/54 (18.5)	
Not Hispanic or Latino	216 (73.2)	72/209 (34.4)		30/193 (15.5)	
Unknown	14 (4.7)	3/14 (21.4)		2/13 (15.4)	
Body habitus			0.127		0.047
Underweight	47 (15.9)	18/46 (39.1)		10/41 (24.4)	
Normal/overweight	185 (62.7)	63/182 (34.6)		27/165 (16.4)	
Obese	63 (21.4)	15/59 (25.4)		5/54 (9.3)	
Patient had a preexisting condition			0.022		0.629
No	152 (51.5)	40/147 (27.2)		22/145 (15.2)	
Yes	143 (48.5)	56/140 (40.0)		20/115 (17.4)	

[a]*p* values for body habitus from two-sided Cochran-Armitage test for trend. All other *p* values from chi-square test.

conditions were most common. In a multicenter cohort study of pediatric OHCA, Moler et al (8) similarly found that preexisting lung or airway disease was associated with increased hospital survival but the explanation for this observation is unclear.

Our findings show worse outcomes from pediatric OHCA as body mass increases. In a registry study of pediatric in-hospital cardiac arrest, obesity was found to be associated with a lower rate of event survival and survival to hospital discharge (23). Proposed explanations included inability to provide adequate force and depth to chest compressions, and inappropriate plasma and tissue concentrations of resuscitation medications and energy levels for defibrillation, as these are typically weight based. Unexpectedly, underweight children in our study had better outcomes than normal weight children. No differences in outcomes were found between underweight and normal weight children in the in-hospital study.

Gender, race, and ethnicity were not associated with survival or neurobehavioral function in our study. Female gender has been associated with better outcomes in adult OHCA research, possibly due to a protective hormonal effect in premenopausal women (24, 25).

Respiratory causes were the most common etiology of OHCA in our study and included drowning and ALTE/SUID. Other pediatric OHCA studies that categorized arrest etiology more consistent with Utstein definitions found cardiac causes to be most prevalent (9, 10, 12). Utstein definitions presume a cardiac cause when another etiology cannot be identified (26). Infants with ALTE/SUID typically lack an identifiable cause for the event.

TABLE 2. Cardiac Arrest Characteristics and Associations With Outcomes

Characteristic	Overall, *n* (%)	Survived to 12 Mo, *n* (%)	*p*[a]	Survived to 12 Mo With Vineland Adaptive Behavior Scales, Second Edition ≥ 70, *n* (%)	*p*[a]
Total	295	96/287 (33.4)		42/260 (16.2)	
Primary etiology of cardiac arrest			< 0.001		< 0.001
Cardiac	37 (12.5)	19/37 (51.4)		13/31 (41.9)	
Acute life threatening event/sudden unexpected infant death	46 (15.6)	6/46 (13.0)		3/45 (6.7)	
Drowning	74 (25.1)	32/69 (46.4)		16/65 (24.6)	
Other respiratory	93 (31.5)	28/91 (30.8)		6/79 (7.6)	
Other/unknown	45 (15.3)	11/44 (25.0)		4/40 (10.0)	
Initial cardiac arrest rhythm noted by EMS or hospital			0.038		< 0.001
Asystole	172 (58.3)	47/169 (27.8)		14/151 (9.3)	
Bradycardia	19 (6.4)	8/18 (44.4)		3/17 (17.6)	
Pulseless electrical activity	43 (14.6)	15/43 (34.9)		9/39 (23.1)	
Ventricular fibrillation or tachycardia	23 (7.8)	13/22 (59.1)		9/21 (42.9)	
Unknown	38 (12.9)	13/35 (37.1)		7/32 (21.9)	
Estimated duration of chest compressions, min			< 0.001		< 0.001
≤ 15	66 (22.4)	32/62 (51.6)		16/54 (29.6)	
> 15 to ≤ 30	109 (36.9)	42/106 (39.6)		18/97 (18.6)	
> 30	108 (36.6)	19/108 (17.6)		7/98 (7.1)	
Unknown	12 (4.1)	3/11 (27.3)		1/11 (9.1)	
Chest compressions still required at time of arrival at the first hospital			< 0.001		0.001
No	92 (31.2)	42/86 (48.8)		21/77 (27.3)	
Yes	197 (66.8)	52/195 (26.7)		20/178 (11.2)	
Unknown	6 (2.0)	2/6 (33.3)		1/5 (20.0)	
Total no. of doses of epinephrine administered by EMS and at hospital			< 0.001		< 0.001
0	19 (6.4)	12/15 (80.0)		8/12 (66.7)	
1	36 (12.2)	19/35 (54.3)		10/31 (32.3)	
2	52 (17.6)	21/51 (41.2)		10/48 (20.8)	
3	40 (13.6)	15/39 (38.5)		5/35 (14.3)	
4	41 (13.9)	15/41 (36.6)		5/38 (13.2)	
> 4	77 (26.1)	9/77 (11.7)		3/72 (4.2)	
Unknown	30 (10.2)	5/29 (17.2)		1/24 (4.2)	
Cardiac arrest witnessed			< 0.001		0.013
No	172 (58.3)	43/165 (26.1)		19/154 (12.3)	
Yes	109 (36.9)	50/108 (46.3)		23/94 (24.5)	
Unknown	14 (4.7)	3/14 (21.4)		0/12 (0.0)	

(*Continued*)

TABLE 2. (*Continued*). Cardiac Arrest Characteristics and Associations With Outcomes

Characteristic	Overall, *n* (%)	Survived to 12 Mo, *n* (%)	*p*[a]	Survived to 12 Mo With Vineland Adaptive Behavior Scales, Second Edition ≥ 70, *n* (%)	*p*[a]
Chest compressions administered by bystander			0.858		0.998
No	97 (32.9)	33/97 (34.0)		14/86 (16.3)	
Yes	186 (63.1)	59/179 (33.0)		27/166 (16.3)	
Unknown	12 (4.1)	4/11 (36.4)		1/8 (12.5)	
Time of arrest[b]			0.876		0.883
Day	205 (69.5)	67/202 (33.2)		29/182 (15.9)	
Night	90 (30.5)	29/85 (34.1)		13/78 (16.7)	
Day of arrest[c]			0.001		0.091
Weekday	214 (72.5)	81/207 (39.1)		35/189 (18.5)	
Weekend	81 (27.5)	15/80 (18.8)		7/71 (9.9)	

EMS = emergency medical services.

[a]*p* values for estimated duration of chest compressions and total number of doses of epinephrine administered by EMS and at hospital from two-sided Cochran-Armitage test for trend. All other *p* values from chi-square test of no association.

[b]Day is defined as 7:00 AM to 6:59 PM; night as 7:00 PM to 6:59 AM.

[c]Weekday is defined as Monday 12:00 AM to Friday 11:59 PM; weekend as Saturday 12:00 AM to Sunday 11:59 PM.

Although ALTE/SUID is believed to result most often from respiratory problems, misclassification as cardiac could result when unknown etiologies are presumed cardiac. In a study linking coroner reports to a cardiac arrest registry, only 19 of 114 pediatric OHCA cases that were presumed cardiac had a cardiac cause of death on autopsy (6). Overall, the high prevalence of respiratory causes of OHCA is important to recognize and supports the recommendation for both chest compressions and rescue breathing as the preferred approach for pediatric OHCA resuscitation (27).

In our study, respiratory causes of arrest were associated with worse outcomes than cardiac causes. Among respiratory causes, ALTE/SUID had worse outcomes, and drowning had better outcomes. On multivariate analysis, ALTE/SUID was associated with lower 12-month survival and 12-month survival with VABS-II greater than or equal to 70. These findings are consistent with other reports of pediatric OHCA (1, 8, 15, 28, 29).

Asystole was the most common initial arrest rhythm observed in our study. Asystole had worse outcomes, and VF/VT had better outcomes consistent with other research (1, 4, 5, 11, 30, 31). Despite better outcomes with a shockable rhythm, data from a U.S. registry showed young children are less likely to have an automated external defibrillator (AED) used during resuscitation than older children or adults, possibly due to arrests more often occurring at home rather than in public locations where AEDs are available (2).

The proportion of children receiving chest compressions on hospital arrival and the number of epinephrine doses administered are expected to increase with longer durations of chest compressions. On univariate analysis, each of these characteristics was associated with outcome. On multivariate analysis, duration of chest compressions was associated with 12-month survival and 12-month survival with VABS-II greater than or equal to 70. Our findings concur with those of Moler et al (8) who reported that cardiopulmonary resuscitation (CPR) not ongoing at hospital arrival, fewer epinephrine doses, and shorter CPR duration were associated with increased hospital survival. López-Herce et al (22) found that CPR less than 20 minutes was the best indicator of survival.

Witnessed arrests were associated with better outcomes in our study, but bystander compressions were not. If adequately provided, bystander compressions may reduce the period of no blood flow and delay rhythm deterioration from VF/VT to asystole thereby increasing the potential for successful defibrillation. In a study of dispatcher-assisted bystander CPR for pediatric OHCA, dispatcher instruction was associated with increased rates of bystander CPR, and improved neurologic outcomes (32). Dispatcher-assisted CPR requires further study.

Our findings show worse 12-month survival for OHCA on weekends compared to weekdays. Kitamura et al (30) similarly reported better 1-month survival and 1-month survival with good neurologic outcome for pediatric OHCA occurring during the daytime and on weekdays. Potential explanations included shorter response times, better postresuscitation care, and a greater proportion of daytime and weekday arrests occurring in schools with AEDs.

Lower postarrest blood pH and higher blood glucose and lactate concentrations were associated with worse outcomes in our study. Others have similarly shown biochemical measures such as pH, glucose, and lactate early after ROC to be associated with survival in children experiencing cardiac arrest (8, 33). However, biochemical measures have not been shown to be accurate enough for definitive prognostication of patients (34).

Strengths of our study include the multicenter longitudinal design, and the use of a well-defined measure of neurobehavioral function. Limitations include the select sample of

TABLE 3. Logistic Regression Models for the Outcomes of "Survived to 12 Months" and "Survived to 12 Months With Vineland Adaptive Behavior Scales, Second Edition >70"

Characteristic	OR (95% CI)	*p*
Survived to 12 mo		
Primary etiology of cardiac arrest		< 0.001
Cardiac	Reference	
ALTE/SUID	0.25 (0.07–0.92)	
Drowning	1.73 (0.62–4.83)	
Other respiratory	0.44 (0.17–1.12)	
Other/unknown	0.39 (0.13–1.20)	
Estimated duration of chest compressions, min		< 0.001
≤ 15	Reference	
> 15 to ≤ 30	1.00 (0.47–2.11)	
> 30	0.26 (0.12–0.56)	
Day of arrest		< 0.001
Weekday	Reference	
Weekend	0.29 (0.14–0.60)	
Cardiac arrest witnessed		0.010
No	0.41 (0.21–0.81)	
Yes	Reference	
Survived to 12 mo with Vineland Adaptive Behavior Scales, Second Edition ≥ 70		
Primary etiology of cardiac arrest		< 0.001
Cardiac	Reference	
ALTE/SUID	0.15 (0.03–0.62)	
Drowning	0.62 (0.23–1.67)	
Other respiratory	0.10 (0.03–0.35)	
Other/unknown	0.20 (0.05–0.77)	
Estimated duration of chest compressions, min		0.008
≤ 15	Reference	
> 15 to ≤ 30	0.71 (0.29–1.72)	
> 30	0.21 (0.07–0.58)	

ALTE/SUID = acute life threatening event/sudden unexpected infant death, OR = odds ratio.

children recruited to the THAPCA-OH trial which restricts the applicability of our results to children who are comatose and require mechanical ventilation after OHCA. Other limitations include the large number of associations evaluated; variation in postarrest management which could potentially impact associations between cardiac arrest characteristics and outcomes; and our relatively small sample size and missing data for some variables which limited our ability to generate multivariate models. In particular, missing data for laboratory values prevented their inclusion in the models.

CONCLUSION

Many factors are associated with survival and neurobehavioral function among children who are comatose and require mechanical ventilation after OHCA. These factors may be useful for identifying children at risk for poor outcomes and for improving prevention and resuscitation strategies.

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