Pediatric Out of Hospital Cardiac Arrest in the State of Arizona

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Abstract

Comprehensive databases which collect data on out of hospital cardiac arrests have been useful in identifying markers of outcome in adults, but this data is limited in children. The Arizona Department of Health Services’ Save Hearts in Arizona Registry and Education (SHARE) database contains data on pediatric cardiac arrests in the field and offers a unique opportunity to examine outcome measures and pre-hospital care.

We retrospectively analyzed 312 children (1-215 months) from the SHARE database between 2004-2010. Variables assessed included bystander cardiopulmonary resuscitation (CPR) administration, transport times and impact of Pediatric Intensive Care Unit (PICU) availability on outcome to hospital discharge. Two hundred forty four (78%) were transported to a medical facility and Pediatric Intensive Care Unit (PICU) availability on outcome to hospital discharge. 

Of 312 children with out of hospital cardiac arrest, 22 (7%) survived to hospital discharge. The low survival rates in this review make statistical comparisons difficult, though potential trends were noted that, with additional numbers to increase power, may provide insight into factors affecting survival from pediatric OHCAs, all of which have not been assessed on a wide scale in this vulnerable population.

Introduction

• Pediatric out-of-hospital cardiac arrest (OHCA) is an uncommon medical emergency associated with significant morbidity due to neurologic sequelae and mortality.
• Approximately 15,000 children suffer OCHA each year from a variety of causes including medical illness, trauma, and most commonly respiratory insults such as drowning or choking.
• Study of pediatric OCHA has been limited and not improved outcomes.
• Various retrospective studies and metaanalyses estimate survival to hospital discharge from 8.4% to 12.1% for pediatric OHCA2.
• Save Hearts in Arizona Registry and Education (SHARE) in 2004 is a public program that operates a statewide Utstein-style registry for every OHCA event in Arizona2.
• The goal of our project was to analyze pediatric OHCA events collected in the SHARE database to investigate how several factors- bystander CPR, post-arrest hospital care, and intubation by EMS providers- have influenced pediatric OHCA outcomes in the state of Arizona.

Methods

Study Design

• We conducted a retrospective cohort study of children (0-18 years) in Arizona who had an OHCA and had records of their event submitted to the SHARE database between December 2004 and July 2010.
• Exclusion criteria was based on signs of cardiac/respiratory arrest as assessed by municipal or private EMS upon arrival to the scene and included trauma and drowning victims.
• This study was a de-identified quality control initiative and exempt from IRB approval.

Data Collection and Analysis

• Utstein-style data elements for each event were collected from EMS and hospital records, de-identified, and entered into the SHARE database.
• The variables from the extensive database that were assessed included: bystander cardiopulmonary resuscitation (CPR) administration, Emergency Medical Services (EMS) interventions, transport times to a medical facility and Pediatric Intensive Care Unit (PICU) availability.
• The primary outcome measurement was survival to hospital discharge. Fisher’s exact test was used to compare survival among groups. ROC contingency tables were used to stratify intubated or non-intubated patients with either the number of other interventions they received or transport times and y square analysis was performed.

Results

Figure 1: Pediatric OHCA Outcomes With and Without Bystander CPR

EMS providers transported pediatric OHCA patients to forty one medical centers throughout the state of Arizona. Of these, 941 (22%) had a designated PICU. Patients (n=105) taken to sites with an identified PICU had survival of 6.0% compared to 2.3% for patients (n=172) at centers without a PICU (p=0.13)(Figure 2).

Figure 2: Pediatric OHCA Outcomes With and Without PICU Care

One hundred and sixty nine patients were intubated either in transport or upon arrival to the ED. Eighty eight patients arrived to the ED without a secure airway and did not obtain return of spontaneous circulation (ROSC).

Figure 3: Transport Times of Intubated Non-Survivors (n=169) by Number of Interventions

Fifty five patients either did not survive to transport (N=11) or did not have their airway status recorded (N=44). The average transport time of an intubated patient was 22 ± 5 minutes compared to 19 ± 6 minutes for patients that arrived in the ED not intubated.

Figure 4: Transport Times of Non-Intubated Non-Survivors (n=88) by Number of Interventions

Intubated survivors had an average transport time of 23 ±9 minutes (n=8) while one non-intubated survivor had a transport time of 53 minutes. Transport time varied by need for pre-hospital intubation and number of interventions (resuscitation medications, defibrillation and fluid bolus) performed by EMS prior to hospital arrival but were not significant. Figures 3 and 4 demonstrates the stratification of non-survivors between intubation status, number of interventions, and transport time.

Discussion and Conclusions

• Pediatric OHCA is an underreported public health problem affecting hundreds of children in Arizona over the last ten years.
• SHARE database provides a powerful tool for investigating factors that may impact survival of pediatric OHCA.
• Low survival rates in this review made statistical comparisons difficult.
• Impact of bystander CPR, treatment at centers with PICUs and transport time on survival remains intriguing but requires larger sample sizes with greater number of survivors to potentially obtain statistical significance.
• Additional data collection or collaboration with other centers might increase statistical power.
• Further investigation may aid in prioritizing pre-hospital care and delivery to pediatric centers as potential means to improve outcomes.

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References