PEDIATRIC SUBMERSION INJURY IN THE HOUSTON METROPOLITAN AREA: A MULTI-CENTER RETROSPECTIVE OUTCOMES REVIEW

Craig F Pymento[1], Rohit Shenoi[2], Danielle Guffey[3], Samuel Prater[4], Kimberly Chambers[5]

[1] Baylor College of Medicine, Department of Texas Children's Hospital

[2] Texas Children's Hospital, Texas Children's Hospital, Emergency Medicine

[3] Baylor College of Medicine, Texas Children's Hospital, Critical Care

[4] Memorial Hermann , Pediatrics, Emergency Medicine

[5] Memorial Hermann, Pediatrics, Emergency Medicine

Background: Resuscitation for submersion injury has one of the highest salvage rates for out of hospital cardiac arrests. In Texas alone, there have been 1,988 pediatric deaths (index 1.5 per 100,000) from 1999-2016. Current literature implicates submersion time and duration of CPR as predictors for submersion injury outcomes. In this study, we retrospectively investigate outcomes for all types of pediatric submersion injury encounters at Texas Children's Hospital and Memorial Hermann Hospital from 2008-2013.

Materials/Methods: Included were children aged 0-18 presenting to Texas Children's Hospital or Memorial Hermann Hospital from 2008-2013 and identified using ICD9 code diagnosis of unintentional submersion injury. Patient information included age, sex, race/ethnicity, and prior medical history. Event information included body of water, submersion time, rescuer, bystander resuscitation, and EMS assessments and interventions. Hospital information included location and highest level of care. Outcome measures included mortality, length of stay, and disability using Utstein criteria. Independent and multivariable logistic regression models were used for analysis.

Results: 744 patients, 465 male and 278 female. Median age of 3 years old (IQR 1.8, 5.0). 356 patients from Texas Children's Hospital, 381 patients from Memorial Hermann Hospital. 96% of patients were previously healthy. Submersion time > 5 minutes had a 23.00 higher odds for mortality when compared to < 5 minutes ($p < 0.001$, 95% CI 9.64-54.87). Bathtub submersions had a 2.38 higher odds for mortality when compared to pool submersions ($p < 0.001$, 95% CI 2.26-2.52). Rescue by EMS had a 13.22 higher odds for mortality when compared to parent rescuers ($p < 0.001$, 95% CI 8.11-21.53). Median length of stay 1 day (IQR 0.0, 2.0). Age ($p < 0.001$, CI 0.96-0.98), unwitnessed events (p 0.02, CI 0.66-0.96), and submersion time > 5 minutes (p 0.005, CI 0.15-0.17) had lower cumulative incidences of hospital discharge (increased length of stay). Bathtub submersions were most common among survivors with severe impairment or in vegetative state ($p < 0.001$).

Conclusions: Pool submersion injuries are often the focus of prevention efforts, yet there is a higher risk for mortality and disability from bathtub submersion events. Duration of submersion was again demonstrated as a risk factor for mortality and increased length of stay. More research is needed, particularly as it relates to bathtub submersion, in order to reduce submersion injury morbidity and mortality.