Characteristics of EMS 9-1-1 Activations for Pediatric Drownings, a National Cross-Sectional Study

Lindsay Walsh, MD[1], Macall Leslie Salewon, MPH[2], Rebecca E. Cash, PhD[3], Jonathan R. Powell, PhD[2], Morgan K. Anderson, MPH[2]
1. Harvard Affiliated Emergency Medicine Residency Program, Department of Emergency Medicine, Mass General Brigham;
2. Clinical and Research Services, ImageTrend; 3. Department of Emergency Medicine, Mass General Brigham, Harvard Medical School

BACKGROUND

Drowning is a leading cause of unintentional injury and death among children in the U.S., with an age-adjusted mortality rate of 3.1 per 100,000 children.[1]

Currently, there is limited literature on prehospital factors that affect outcomes in pediatric drownings,[2] so that public health awareness and prevention can occur.

Our objective was to characterize drownings among children and adolescent patients, with a focus on prehospital emergency medical service (EMS) response to improve public health awareness and prevention and identify risk factors for death and injury.

METHODS

Cross-sectional evaluation of EMS activations for pediatric drownings using the 2024 ImageTrend Collaborate dataset.

9-1-1 Responses → **Patients <18 years old** → **Drowning, Diving, or Submersion Incident***

**Documented in dispatch complaint, provider impression, or cause of injury*

We used descriptive statistics to examine:

- Patient demographics
- Incident characteristics
- Response from bystanders and EMS

RESULTS

Table 1. Demographic, incident, and response characteristics in pediatric drowning patients

	n	%
Total Drowning Cases	1,470	100.0%
Dispatch Complaint of Drowning	1,211	82.4%
Primary or Secondary Impression of Drowning	421	28.6%
Cause of Injury Drowning	538	36.6%
Gender		
Male	836	56.9%
Female	601	40.9%
Missing	33	2.2%
Age		
<1	117	8.0%
1 to 4	698	47.5%
5 to 17	655	44.6%
Race/Ethnicity		
White	651	44.3%
Black	245	16.7%
Hispanic/Latino	233	15.9%
Asian	30	2.0%
American Indian or Alaskan Native	13	0.9%
Native Hawaiian or Other Pacific Islander	13	0.9%
Other	78	5.3%
Missing	207	14.1%
Day of Week		
Weekday (Mon.- Thurs.)	657	44.7%
Weekend (Fri.-Sun.)	813	55.3%
Time of Day		
00:01- 6:00	20	1.4%
6:01-12:00	255	17.4%
12:01-18:00	854	58.1%
18:01-24:00	341	23.2%
Unit Level of Service		
ALS	1,112	75.6%
BLS	177	12.0%
Critical Care	97	6.6%
Other/Not Specified	84	5.7%
Cardiac Arrest Reported		
Yes, Prior to EMS Arrival	283	19.3%
Yes, After EMS Arrival	6	0.4%
No	1,032	70.2%
Missing	149	10.1%
Transported		
Yes	1,098	74.7%
No	357	24.3%
Missing	15	1.0%

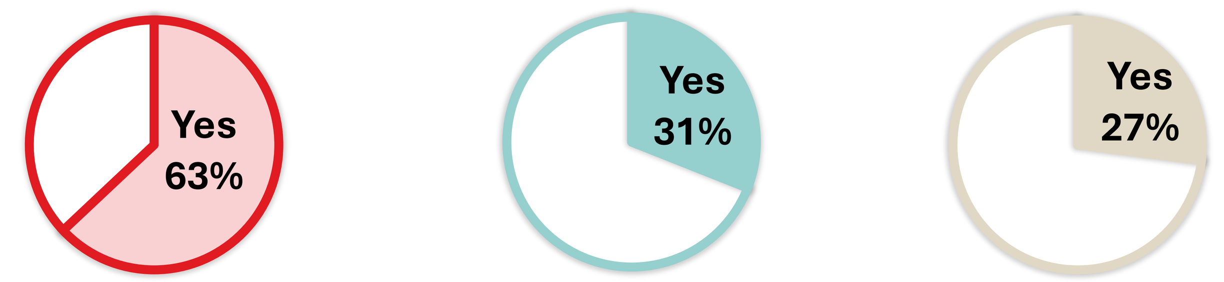
Response in pediatric drowning patients that experienced cardiac arrest on-scene

Of the 1,470 cases of pediatric drowning, **19.7% (n=289) experienced cardiac arrest**

Who Initiated CPR?

Bystander	First Responder (EMS, Fire, Law)	*Missing*
(n=175; 60.6%)	(n=86; 29.8%)	(n=28; 9.7%)

Did patient experience return of spontaneous circulation (ROSC)?



CONCLUSIONS

Consistent with prior studies, pediatric drownings were **most commonly**:

- Between the ages of **1 to 4 years old**
- Occurred during **afternoon/evening** and on **weekends**
- Resulted in **transport** by EMS

Bystanders initiated CPR in **3 out of every 5** of cases with cardiac arrest, and those patients had **double** the proportion of ROSC compared to ones who had CPR initiated by first responders

REFERENCES

1. Clemens T, et al. Vital signs: drowning death rates, self-reported swimming skill, swimming lesson participation, and recreational water exposure - United States, 2019-2023. MMWR Morb Mortal Wkly Rep. 2024;73(20):467–73. doi: 10.15585/mmwr.mm7320e1
2. Popp, L. M., et al. (2021). Prehospital Cross-Sectional Study of Drowning Patients Across the United States. Wilderness & environmental medicine, 32(3), 271–277. https://doi.org/10.1016/j.wem.2021.03.003

CONTACT

Lindsay V. Walsh, MD lvwalsh@mgb.org