

# A Statewide Analysis of EMS' Pediatric Trauma Team Activations for Motor Vehicle Incidents

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**Background:** In 2019, on average, 3 children were killed and 502 children were injured every day in traffic crashes across the U.S.<sup>1</sup> The leading cause of death for children within the nation and South Carolina is motor vehicle (MV) accidents.<sup>2</sup> These incidents not only impact car occupants, but also pedestrian and pedal cyclist youth. In the prehospital setting, trauma team activation (TTA) can help reduce morbidity and mortality from severe trauma.

**Objective:** Identify prevalence of children involved in emergent MV incidents and variables associated with an increased use of a TTA for pediatric MV incidents in South Carolina.

**Methods:** This retrospective study utilized deidentified electronic health records from South Carolina emergency medical services (EMS) from 1/1/2019 to 12/31/2021. Incidents included in the analysis were 911 response, pediatric patients, transported by EMS and had a traumatic injury involving a MV. Variables analyzed included South Carolina regions, patient gender, patient age, method of transport, initial total Glasgow Coma Score (GCS), initial patient acuity, cause of injury, airbag usage, and restraint usage.

**Results:** In total, South Carolina had 5,658 pediatric (<16 years) prehospital motor vehicle trauma-related incidents, with 1,207 (21%) having a TTA documented. Of these trauma activations, 53% were male, 44% were 13-16 years old, 93% were transported by ground ambulance, 14% had a total GCS score of 13 or less, 56% had a critical (14%) or emergent (42%) initial patient acuity (eSituation.13), 51% indicated airbag deployed in vehicle (eInjury.07), 30% indicated no restrain usage. Odds ratios (OR) and 95% confidence Intervals (95% CI) for prehospital TTA. There was an increased odds for TTA in patients under the age of 4 years old (aOR = 1.49, 95% CI 1.20-1.86) compared to patients 13-16 years; GCS < 13 (aOR = 12.05, 95% CI 8.41-17.26); pedestrians/pedal-cyclists (aOR = 2.40, 95% CI 1.76-3.28), off-road/all-terrain vehicles (aOR = 2.72, 95% CI 2.02-3.68), and motorcycle (aOR = 3.33, 95% CI 2.11-5.24) compared to on road vehicle driver/occupants. Additional unadjusted OR analysis found, incidents involving airbag deployment increased odds of TTA by 52% and the usage of seatbelt/car seat reduced odds of TTA by 69%.

**Conclusion:** Younger pediatrics (< 4 years), incidents located in Pee Dee region, GCS less than 13, pedestrian/pedal-cyclist, off-road/all-terrain vehicle, or motorcycle riders had higher odds of trauma team activation in South Carolina. A review of South Carolina's trauma team activation protocol along with patient outcomes may help identify additional criteria that could improve outcomes for pediatric patients involved in MV incidents. Improving prehospital documentation related to injury information (ex. seatbelt/car seat use, airbag deployment, anatomical location of most severe injury, etc.) may also help improve trauma-related protocols by utilizing retrospective data. Additionally, review of public health campaigns that focus on car occupant restraint usage in South Carolina should be considered.

## References:

1. National Highway Traffic Safety. (2022). Traffic Safety Facts: 2019 Data: Children.

<https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813122>

2. Centers for Disease Control and Prevention. (2022). WISQARS: Leading Causes of Death Reports, 1981-2020.

<https://wisqars.cdc.gov/fatal-leading>

**Table 1. Descriptives of Pediatric Prehospital Emergent Response Motor Vehicle Incidents (2018-2021)**

Variables	All	Trauma Team Activation*	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
N (%)	5,655	1,207(21.3%)	-	-
<b>Incident Location by South Carolina Regions</b>				
Upstate	19.1%	19.3%	1.00	1.00
Midlands	27.1%	23.0%	0.81(0.66-0.98)*	0.83(0.67-1.03)*
Pee Dee	18.2%	23.6%	1.39(1.14-1.70)*	1.63(1.30-2.04)*
Low Country	22.7%	17.1%	0.70(0.57-0.86)*	0.72(0.57-0.90)*
Unknown	13.0%	16.9%	-	-
<b>Patient Gender (ePatient.13)</b>				
Male	47.7%	52.9%	1.00	-
Female	52.2%	47.1%	0.77(0.68-0.88)	-
<b>Age (ePatient.15)</b>				
<4 years	15.2%	19.6%	1.36(1.14-1.62)*	1.49(1.20-1.86)*
5-8 years	19.4%	17.8%	0.87(0.73-1.04)	1.07(0.87-1.33)
9-12 years	22.2%	18.3%	0.77(0.64-0.91)*	0.93(0.76-1.15)
13-16 years	43.2%	44.2%	1.00	1.00
<b>Type of Transport</b>				
Ground	98.2%	92.8%	1.00	-
Air	1.8%	7.2%	21.53(12.58-36.84)*	-
<b>GCS Scores</b>				
< 13	3.9%	13.6%	12.08(8.85-16.48)*	12.05(8.41-17.26)*
14-15	92.3%	84.4%	1.00	1.00
Unknown	3.8%	2.0%	-	-
<b>Initial Patient Acuity (eSituation.13)</b>				
Critical	4.2%	14.4%	22.06(16.24-30.00)*	-
Emergent	17.1%	41.7%	8.9(7.5-10.5)*	-
Lower Acuity	56.7%	28.7%	1.00	-
Not Recorded	21.9%	15.2%	1.43(1.18-1.73)*	-
<b>Cause of Injury - Groupings (eInjury.01)</b>				
On Road Vehicle	81.9%	72.7%	1.00	1.00
Occupant/Driver				
Pedestrian/Pedal-Cyclist	4.5%	8.5%	2.90(2.24-3.77)*	2.40(1.76-3.28)*
Off-Road/All-Terrain Vehicle	4.7%	8.0%	2.49(1.92-3.23)*	2.72(2.02-3.68)*
Motorcycle	1.9%	3.7%	1.16(0.90-1.49)	3.33(2.11-5.24)*
Unspecified	7.1%	7.0%	-	-
<b>Airbag Deployment</b>				
No	37.1%	28.1%	1.00	-
Yes	47.6%	50.5%	1.52(1.31-1.76)*	-
Not Applicable	4.3%	8.2%	-	-
Unknown	11.1%	13.2%	-	-
<b>Restraint Usage (seatbelt or car seat)</b>				
No	17.5%	30.2%	1.00	1.00
Yes	67.0%	47.8%	0.31(0.26-0.36)*	0.28(0.24-0.34)*
Not Applicable	4.3%	8.2%	-	-
Unknown	11.2%	13.8%	-	-

\*P-value ≤ 0.05 were considered significant