



EMS on Scene Debate: Stay and Play

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July 13, 2022



Why focus on EMS activities?



Preventable

1. Mortality

Hemorrhage is number 1 cause of preventable death

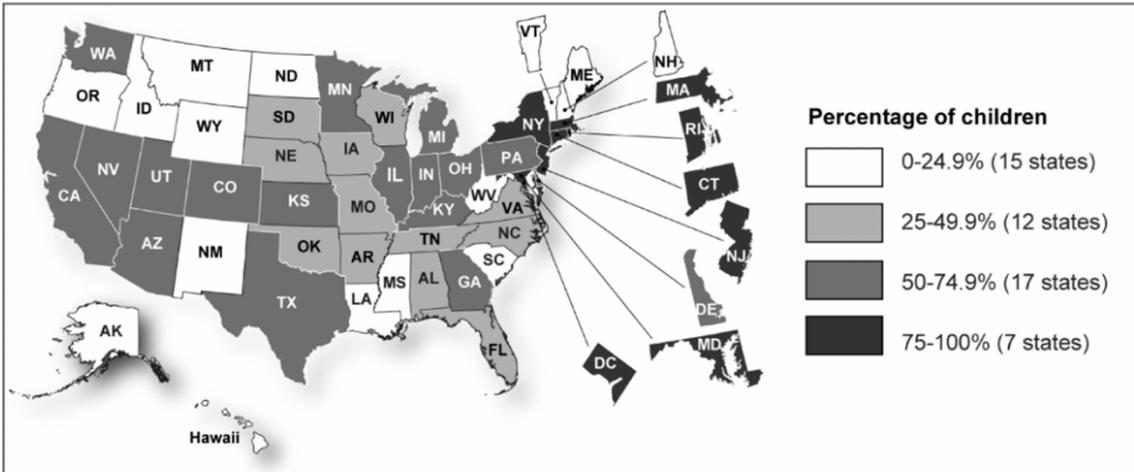
2. Morbidity

Complications

Urban vs Suburban vs Rural

Preventable Mortality

Estimated Percentage of Children Who Lived within 30 Miles of a High-Level Pediatric Trauma Center, by State, 2011-2015



Sources: GAO analysis of American Trauma Society and U.S. Census Bureau data (data); Map Resources (map). | GAO-17-334

57% of children during 2011-2015 lived within 30 miles of a pediatric trauma center¹

>=17.4 million children could not reach a pediatric trauma center within an hour by air or ground transportation²

21% of pediatric trauma deaths preventable/potentially preventable, 7% prehospital³

1. GAO Report. <https://www.gao.gov/assets/gao-17-334.pdf>

2. M. L. Nance, B. G. Carr, and C. C. Branas, "Access to Pediatric Trauma Care in the United States." *Archives of Pediatric & Adolescent Medicine*, vol. 163, no. 6 (2009)

3. Drake, S. A., et al. (2020). "Establishing a regional pediatric trauma preventable/potentially preventable death rate." *Pediatr Surg Int* **36**(2): 179-189.

Pre-hospital PROBLEMS



LESS comfortable with
pediatric patients¹



Scene time



Transport time

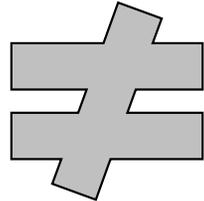
EMS Pre-Hospital Intervention (PHI) does NOT increase delays OR worsen outcomes

- 1884 pediatric trauma patients (EMS transported)
- PHI and non-PHI cohorts were matched 1:1 to compare outcomes
- Mostly every measure of injury severity was worse in those who required PHI
- Controlling for severity, for PHI and non-PHI matched cohorts
 - EMS on-scene time was 18 (13) versus 14 (13) min (P=0.551)
 - EMS arrival at the hospital was 31 (16) versus 28 (12) min (P=0.292)
 - Length of stay was 5 (15) versus 4 (12) d (P=0.368)
 - Mortality was 31.7% versus 28.3% (P=0.842)

EMS Pre-Hospital Intervention (PHI) does NOT increase delays OR worsen outcomes

- Patients who were mortally wounded, despite having significantly higher rates of PHI, still had similar transportation times to those who survived
- PHIs did not delay transportation times or worsen outcomes in pediatric trauma patients
- Although mortally injured children more often required PHIs, this did not delay transportation to the trauma center

**EMS Pre-Hospital
Interventions**

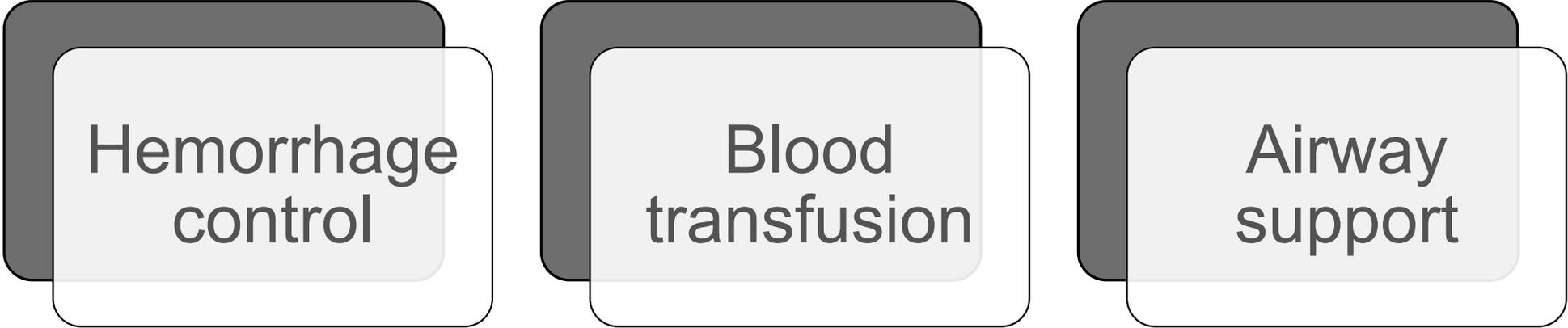


**Delayed
Transports**

or

**Poor Patient
Outcomes**

EMS can help kids!



Hemorrhage
control

Blood
transfusion

Airway
support

Pre-Hospital SOLUTIONS

• Hemorrhage control

- One center cause of death: TBI (66%), anoxia (9.7%), hemorrhage (8%)¹
- One county cause of death: TBI (40%), Hemorrhage (18%)
 - Potentially preventable/preventable death from hemorrhage: **47% of hemorrhage deaths**²



Pre-Hospital SOLUTIONS

Blood Transfusion

Less crystalloid in 24 hours

Improved coagulopathy, base deficit, hemoglobin levels

No difference in mortality

Decreased SIPA score on admission

No difference in transfusion total¹

Shock Index, Pediatric Age-Adjusted (SIPA) ☆

Predicts mortality in children with blunt trauma.

INSTRUCTIONS
Use in blunt trauma patients 4-16 years of age.

When to Use ▾ Pearls/Pitfalls ▾ Why Use ▾

Age
4-16 years old only years

Maximum heart rate Norm: 60 - 100 beats/min

Minimum systolic blood pressure Norm: 100 - 120 mm Hg

Result:
Please fill out required fields.

» Next Steps Evidence Creator Insights

Pre-Hospital SOLUTIONS

Airway support

Pediatric patients in a suburban/rural setting¹

"intubation at either the scene or referring hospital is associated with increased mortality, longer length of intubation, and higher complication rate..."

"...patients with decreased age, high ISS, and low GCS are at high risk of complications and mortality"

Mortality differences are mostly driven by ISS and GCS



Endotracheal Intubation: Medication & Training

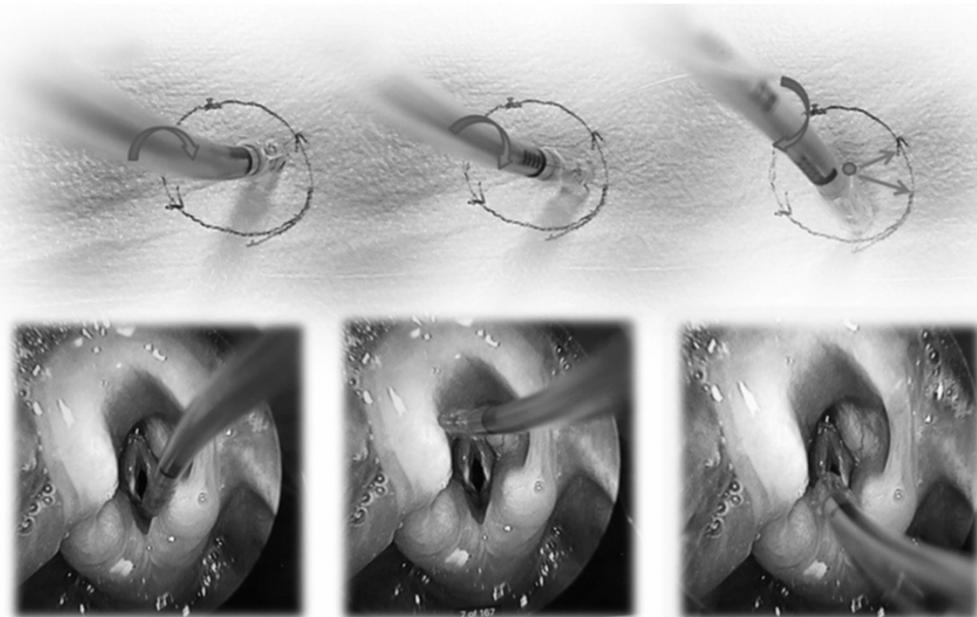
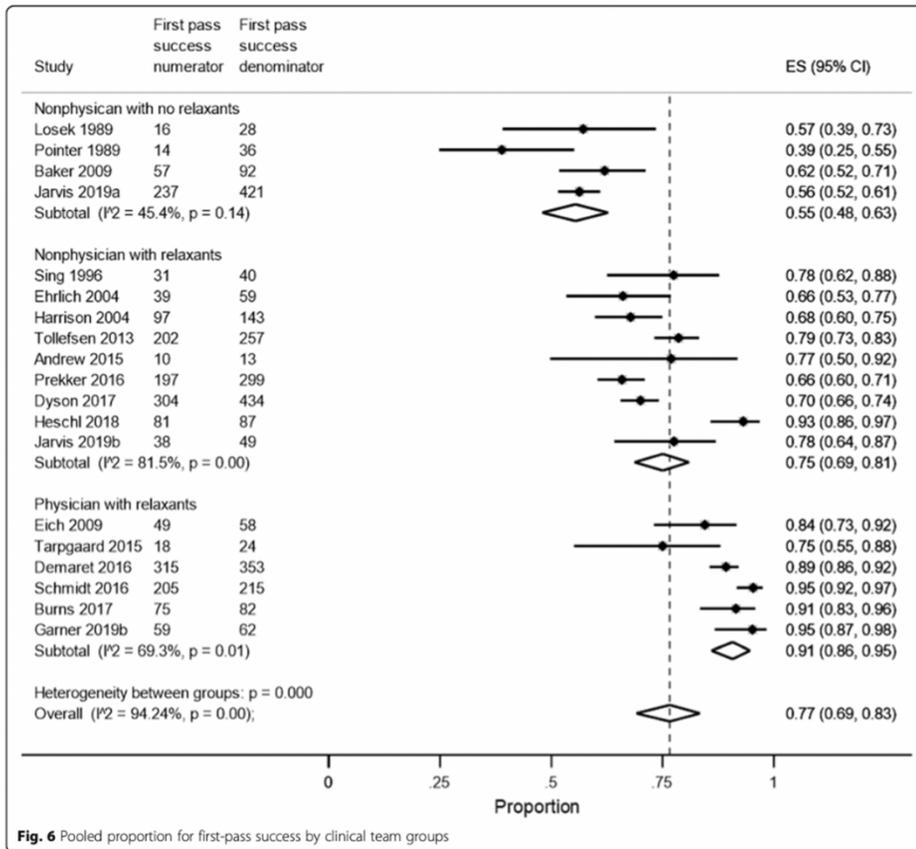


Figure 2

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Improving EMS Intubation Capabilities



Pre-hospital intubation data aren't sufficient for pediatric trauma patients¹



Training is often inadequate, but can be improved²



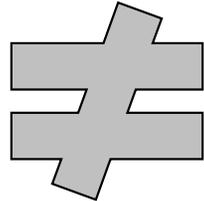
Adult pre-hospital "intubation bundle" reduced per-intubation hypoxia from 44.2% → 3.5%³

1. Carney, N., et al. (2021). "Prehospital Airway Management: A Systematic Review." *Prehosp Emerg Care*: 1-12..

2. Heschl, S., et al. (2018). "Efficacy of pre-hospital rapid sequence intubation in paediatric traumatic brain injury: A 9-year observational study." *Injury* 49(5): 916-920.

3. Jarvis, J. L., et al. (2018). "Implementation of a Clinical Bundle to Reduce Out-of-Hospital Peri-intubation Hypoxia." *Ann Emerg Med* 72(3): 272-279 e271.

**EMS Pre-Hospital
Interventions**

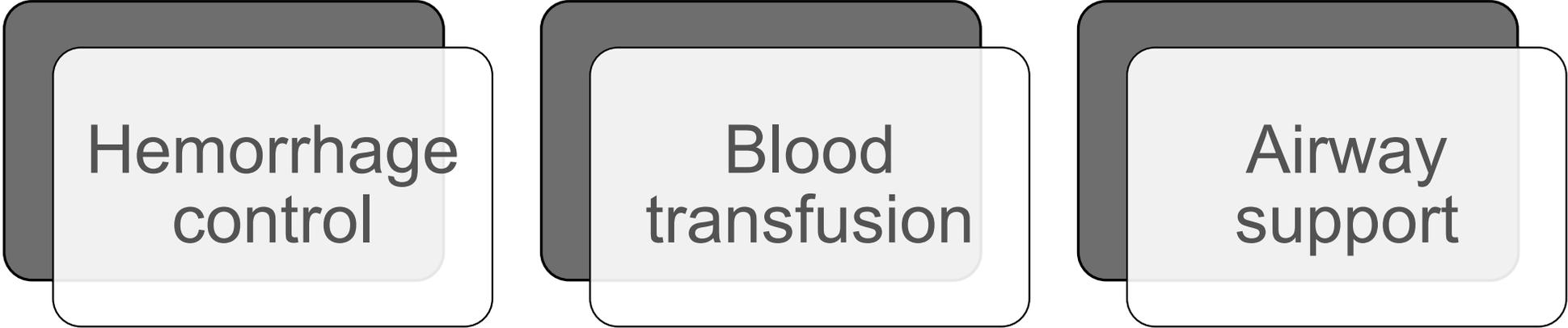


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Suggested Paths Forward



Continue pediatric training

“Comprehensive, ongoing, pediatric-specific education and evaluating pediatric-specific psychomotor and cognitive competencies”¹



Equip EMS with blood for transfusion

Continue research into whole blood transfusion



Continue to improve training for airway support

Simulations

Alternative staffing models (MD on rig)

1. Moore, B., et al. (2020). "Pediatric Readiness in Emergency Medical Services Systems." Ann Emerg Med **75**(1): e1-e6.

LONG LIVE CHILDHOOD

**Thank you Makenzie Ferguson and Nicole Plouffe
for assistance with the graphics!**

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