



Trauma and Emergency Medical Preparedness and Response Science For Better Physical Outcomes

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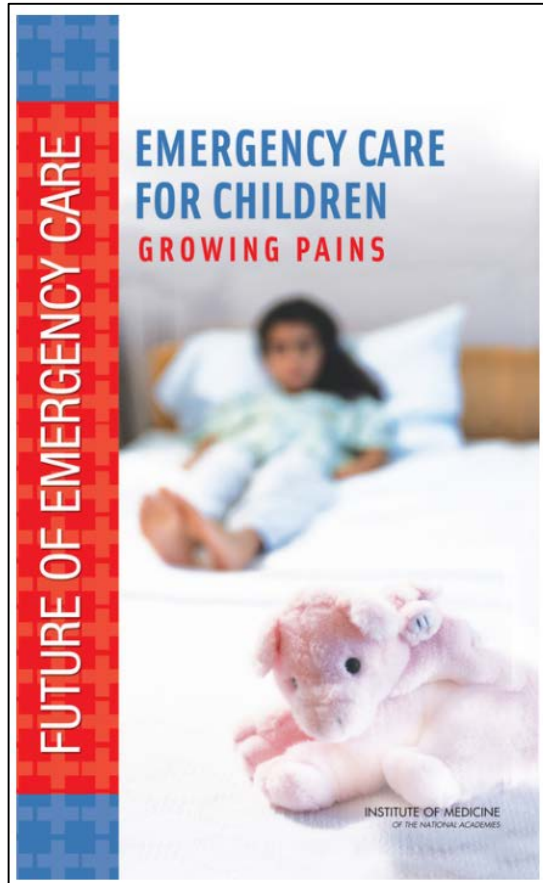
Disclosures and Funding:

- **National Institute of Child Health and Human Development**, grant #R24 HD085927
 - The Value of Pediatric Readiness in the Emergency Care of Injured Children
 - 9/30/2017 - 6/30/2022
- **Health Resources and Services Administration**, grant # H34MC332430100
 - *A Multi-State Evaluation of Emergency Department Pediatric Readiness: Guideline Uptake and Association with Quality, Outcomes, and Cost*
 - 9/1/2019 – 8/31/2023
- **National Institute of Child Health and Human Development**, grant #R01 HD108017
 - Risk prediction and optimizing outcomes to 1-year after firearm injury among children using emergency services in the US
 - 9/17/2021 – 8/31/2024

Emergency Department Pediatric Readiness

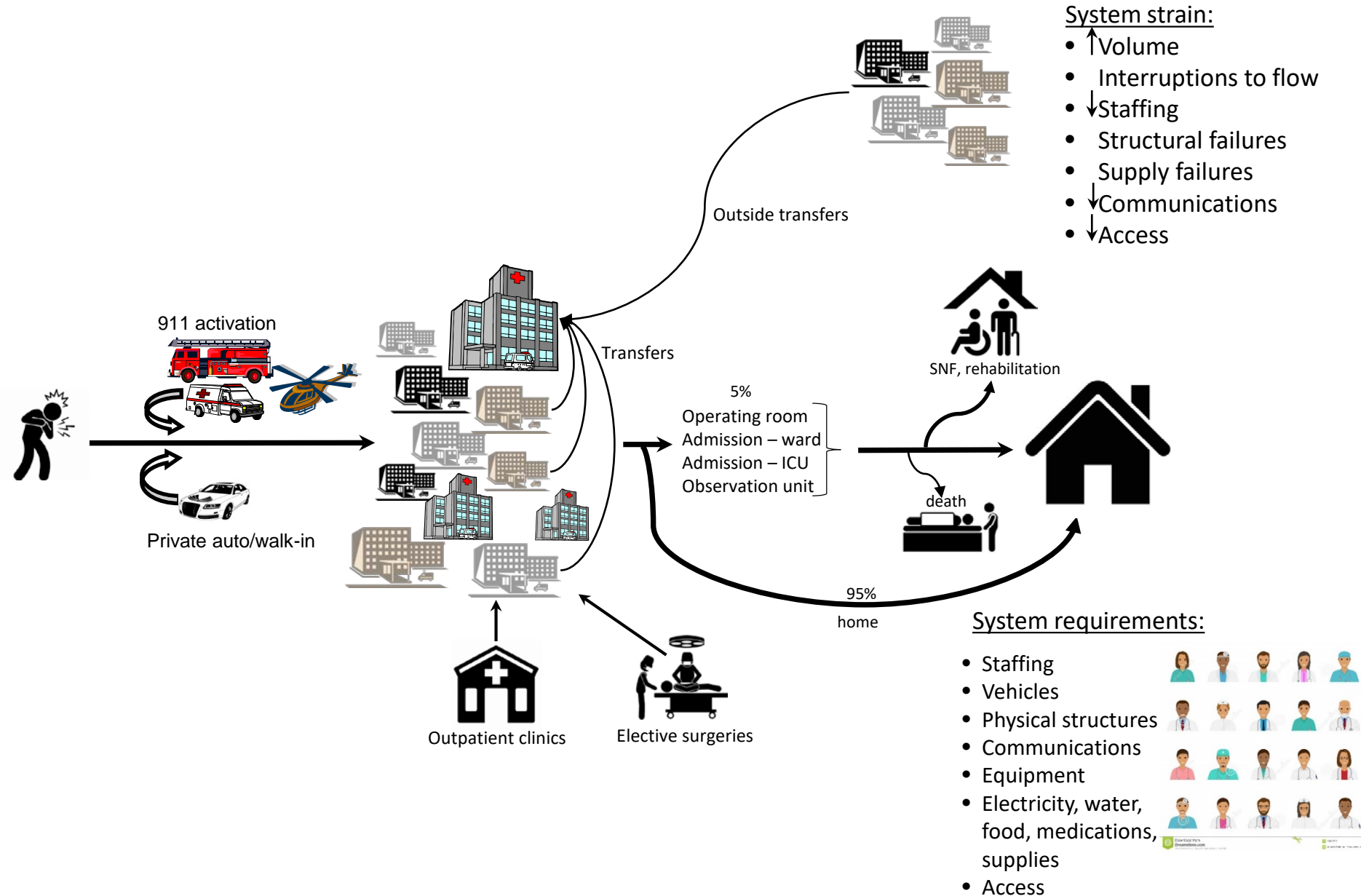
“readiness” = preparedness

Background



- 2006 IOM report
- Large variability in emergency and trauma care for children
- Fractured care in emergency care systems across the US

What is an emergency care system?



ED pediatric readiness

- 55 questions in 6 domains (2013):
 - Policies, procedures, protocols
 - Patient safety
 - Equipment and supplies
 - Quality improvement
 - Personnel
 - Administration and coordination
- Overall score = Weighted Pediatric Readiness Score (wPRS) 0-100



A National Assessment of Pediatric Readiness of Emergency Departments

Marianne Gausche-Hill, MD; Michael Ely, MHRM; Patricia Schmuhl, BA; Russell Telford, MA; Katherine E. Remick, MD; Elizabeth A. Edgerton, MD, MPH; Lenora M. Olson, PhD, MA

- National assessment of ED pediatric readiness in 2013
- 4,149 EDs, representing 24 million pediatric ED visits
- Median wPRS = 68.9 (IQR 56.1-83.6)
- Non-children's hospital EDs care for 82.7% of pediatric ED visits
- 81% of EDs cited barriers to guideline implementation

Emergency Department Pediatric Readiness and Mortality in Critically Ill Children

Stefanie G. Ames, MD, MS,^a Billie S. Davis, PhD,^a Jennifer R. Marin, MD, MSc,^{c,d} Ericka L. Fink, MD, MS,^{c,e}
Lenora M. Olson, PhD, MA,^g Marianne Gausche-Hill, MD,^{e,h,i} Jeremy M. Kahn, MD, MS^{e,f}

- N = 20,483 children with critical illness
- 426 EDs
- 2013 NPRP Assessment

TABLE 3 Adjusted Relationship Between the WPRS of the Presenting Hospital and In-Hospital Mortality

Cohort	Quartile 1	Quartile 2, Odds Ratio (95% Confidence Interval)	Quartile 3, Odds Ratio (95% Confidence Interval)	Quartile 4, Odds Ratio (95% Confidence Interval)
All patients, <i>n</i> = 18 818	Referent	0.52 (0.30–0.90); <i>P</i> = .018	0.36 (0.22–0.58); <i>P</i> < .001	0.25 (0.18–0.37); <i>P</i> < .001

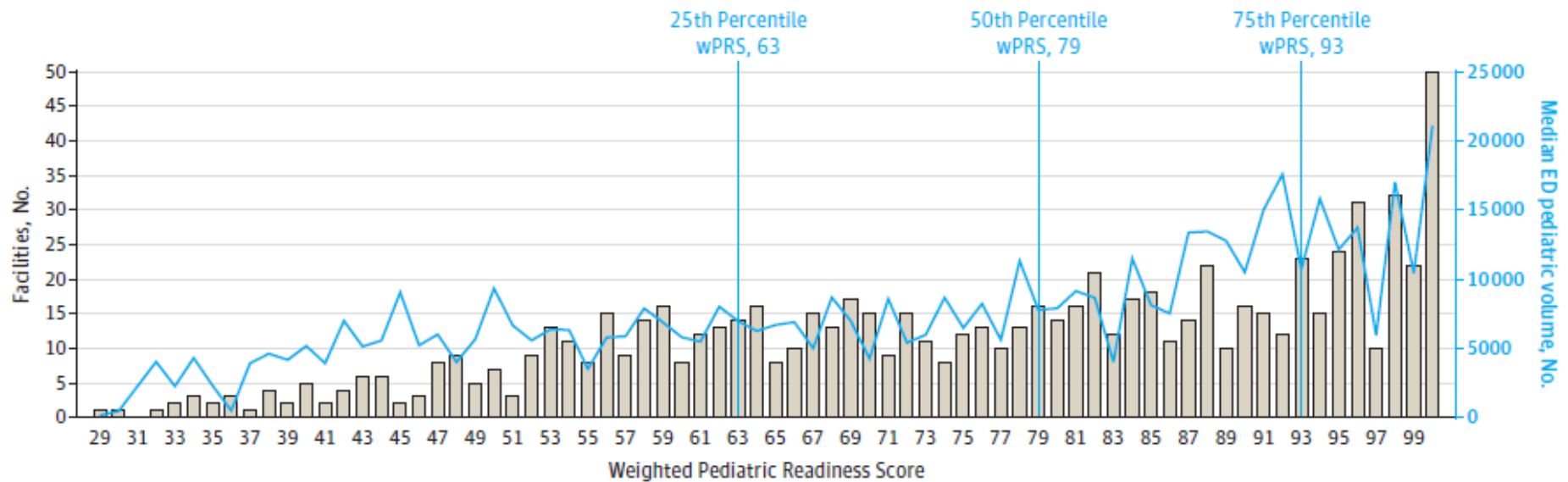
Evaluation of Emergency Department Pediatric Readiness and Outcomes Among US Trauma Centers

Craig D. Newgard, MD, MPH; Amber Lin, MS; Lenora M. Olson, PhD; Jennifer N. B. Cook, GCPH; Marianne Gausche-Hill, MD; Nathan Kuppermann, MD, MPH; Jeremy D. Goldhaber-Fiebert, PhD; Susan Malveau, MS; McKenna Smith, BS; Mengtao Dai, MS; Avery B. Nathens, MD, PhD; Nina E. Glass, MD; Peter C. Jenkins, MD, MSc; K. John McConnell, PhD; Katherine E. Remick, MD; Hilary Hewes, MD; N. Clay Mann, PhD, MS; for the Pediatric Readiness Study Group

- 50 states, 1/1/2012 – 12/31/2017
- $n = 372,004$
- 832 trauma centers

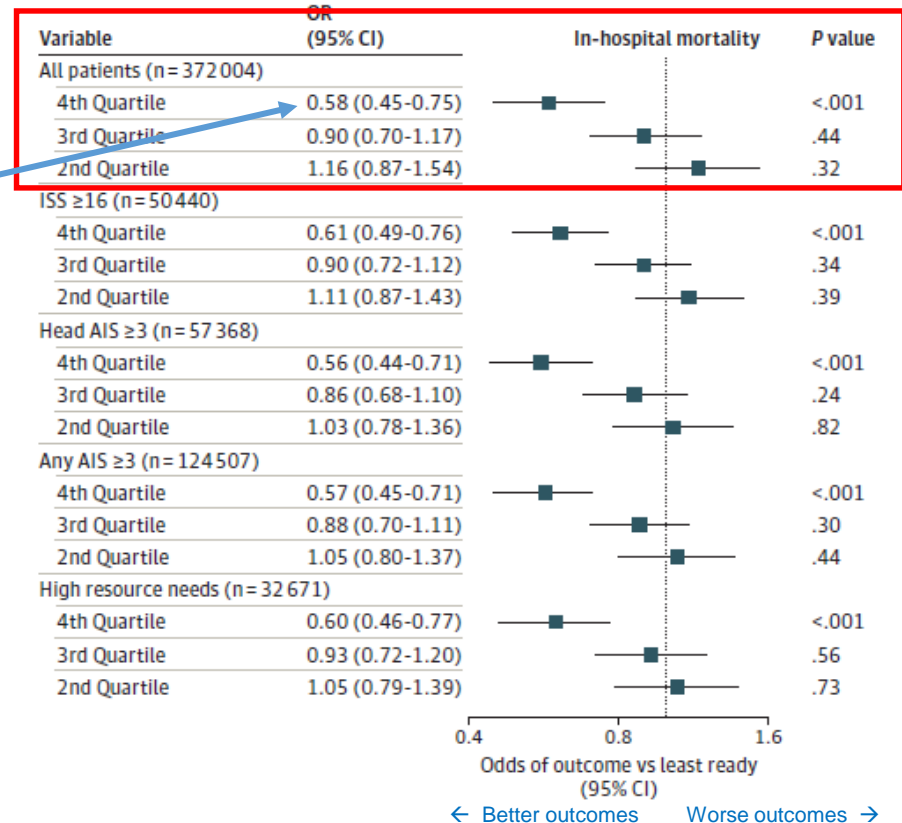
There is large variability in ED pediatric readiness among US trauma centers

Figure 1. Emergency Department (ED) Pediatric Readiness and Annual ED Pediatric Volume in 832 Trauma Center EDs



Adjusted OR of outcomes (compared to least ready quartile)

Figure 2. Adjusted In-Hospital Mortality and Composite Outcome (In-Hospital Mortality (ED) Pediatric Readiness for Injured Children



42% lower odds of dying when initially cared for in a high readiness ED

JAMA Surgery | Original Investigation

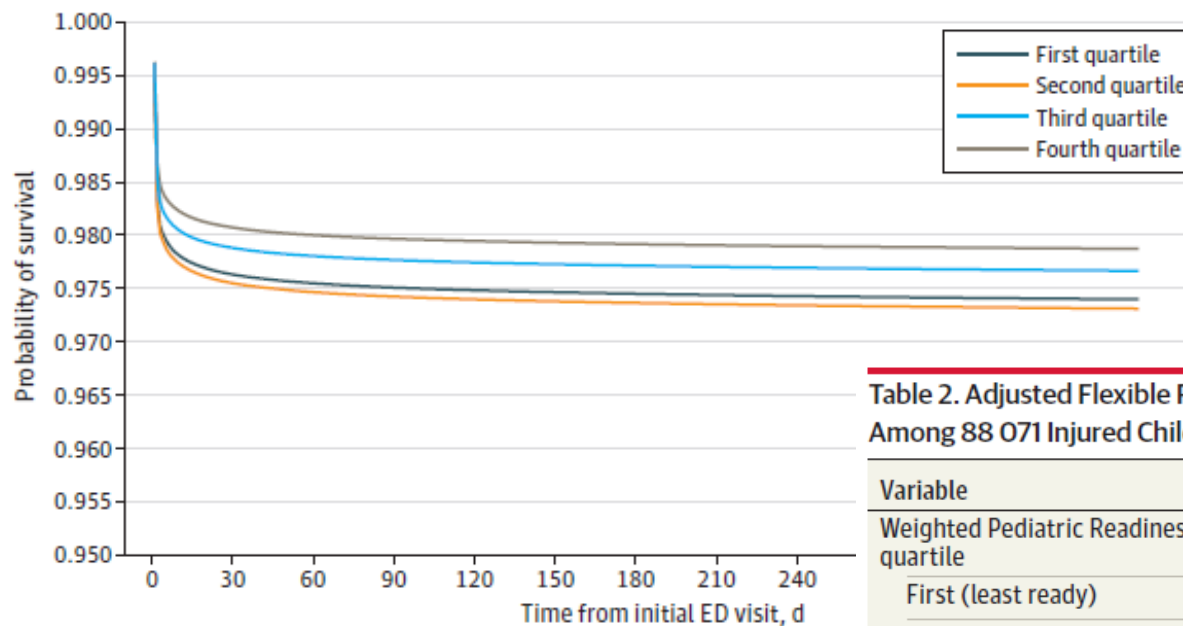
Association of Emergency Department Pediatric Readiness With Mortality to 1 Year Among Injured Children Treated at Trauma Centers

Craig D. Newgard, MD, MPH; Amber Lin, MS; Jeremy D. Goldhaber-Fiebert, PhD; Jennifer R. Marin, MD, MSc; McKenna Smith, MPH; Jennifer N. B. Cook, GCPH; Nicholas M. Mohr, MD, MS; Mark R. Zonfrillo, MD, MSCE; Devin Puapong, MD; Linda Papa, MD, MSc; Robert L. Cloutier, MD, MCR; Randall S. Burd, MD, PhD; for the Pediatric Readiness Study Group

- n = 88,071 injured children, 146 trauma centers
- 15 states, 2012-2017
- 1-year follow-up

Survival curve (adjusted)

Figure 3. Adjusted Time-to-Death Analysis Among 88 071 Injured Children Presenting to 146 Trauma Centers by Emergency Department (ED) Pediatric Readiness



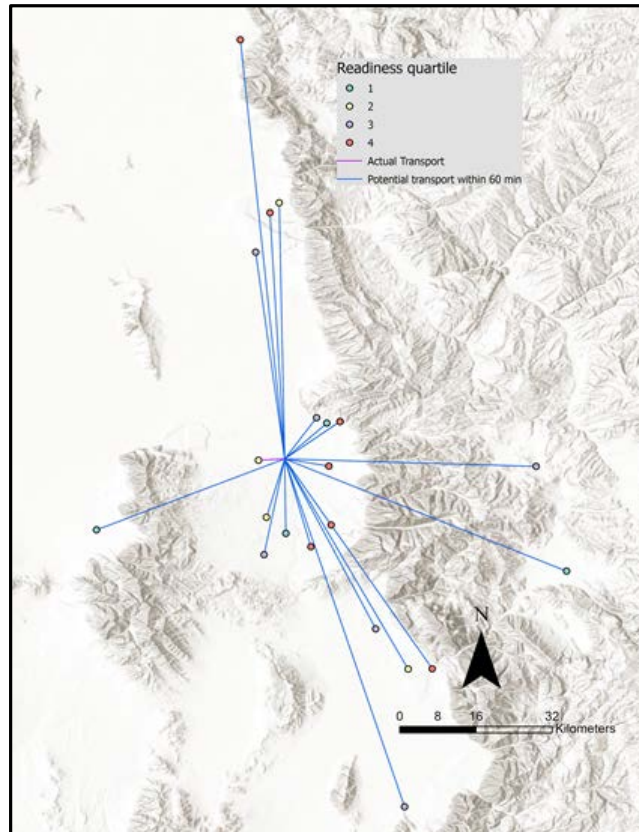
30% lower risk of death to 1 year when initially cared for in a high readiness ED

Table 2. Adjusted Flexible Parametric Spline Model for Mortality to 1 Year Among 88 071 Injured Children Treated in 146 Trauma Centers

Variable	Hazard ratio (95% CI)	P value
Weighted Pediatric Readiness Score, quartile		
First (least ready)	1 [Reference]	
Second	1.10 (0.86-1.4)	<.001
Third	0.82 (0.62-1.06)	
Fourth (most ready)	0.70 (0.56-0.88)	

Prehospital evaluation of ED readiness

- 28 states, 2012-2019
- 5,461 EMS agencies
- n = 808,536 children



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2022, AHEAD-OF-PRINT, 1-11
<https://doi.org/10.1080/10903127.2022.2064020>



A Geospatial Evaluation of 9-1-1 Ambulance Transports for Children and Emergency Department Pediatric Readiness

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- ≈50% transported to EDs in highest quartile of readiness
- Additional 23% within 30 minutes of high ready ED
- **1,719** lives could have been saved by shifting ED selection in these states

Summary

- Emergency care and trauma systems are on the front-line of disasters and children are vulnerable in these systems
- Daily emergency care systems provide a laboratory to study disasters (system strain and capacity challenges)
- High ED preparedness to care for children = improved short- and long-term survival



Thank You