

Supplementary Online Content

Newgard CD, Lin A, Olson LM, et al. Evaluation of emergency department pediatric readiness and outcomes among US trauma centers. *JAMA Pediatr*. Published online June 7, 2021. doi:10.1001/jamapediatrics.2021.1319

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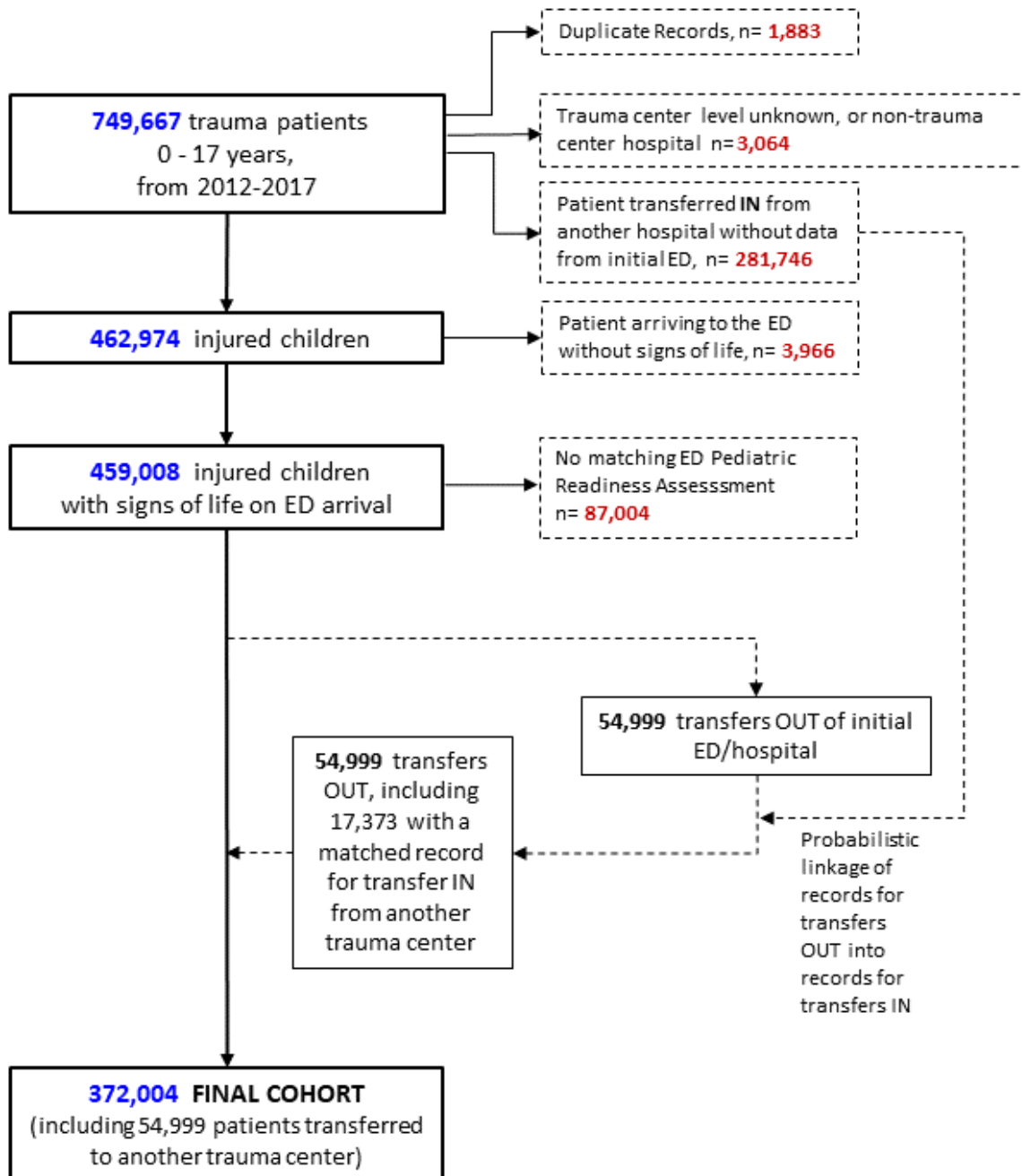
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This supplementary material has been provided by the authors to give readers additional information about their work.

eFigure. Schematic of cohort creation.



eTable 1. Procedures and diagnoses among injured children defining need for “early critical resources” within 24 hours of emergency department presentation (n = 32,671).

Total n=32,671	n (%)
Abdominal	7,701 (23.6%)
Airway	16,331 (50.0%)
Blood transfusion	5,221 (16.0%)
Brain	5,284 (16.2%)
Cardiac	1,724 (5.3%)
ECMO	26 (0.1%)
Neck	420 (1.3%)
Spine	1,539 (4.7%)
Thorax	5,340 (16.3%)
Vascular	3,458 (10.6%)
Vasopressors	98 (0.3%)
Spine injury	3,115 (9.5%)

eTable 2. Percent missingness of variables (n = 372,004).

Variable	Percent Missing
ED weighted Pediatric Readiness Score	0 (0.0%)
Sex	0 (0.0%)
Age	0 (0.0%)
Race	14,908 (4.0%)
Any comorbid conditions	0 (0.0%)
Injury mechanism	25,096 (6.7%)
Arrival by ambulance	10,101 (2.7%)
Inter-hospital transfer	0 (0.0%)
SBP	38,782 (10.4%)
GCS	27,599 (7.4%)
Region	0 (0.0%)
Injury severity (ISS, AIS)	697 (0.2%)
Any airway or ventilatory support	34,872 (9.4%)
Blood transfusion	37,542 (10.1%)
Non-orthopedic surgery (spine, brain, thorax, abdomen, or neck)	26,808 (7.2%)
Orthopedic surgery	26,990 (7.3%)
In-hospital complications†	38,083 (10.2%)
In-hospital mortality†	34,365 (9.2%)

*SBP = systolic blood pressure; GCS = Glasgow Coma Scale; ISS = Injury Severity Score; AIS = Abbreviated Injury Scale.

†In-hospital mortality and complications were primarily missing among transfer patients without a record from the second hospital.

eTable 3. Hospital characteristics by quartile of emergency department (ED) pediatric readiness among 832 trauma center EDs.

	ED weighted pediatric readiness score				
	Overall n=832 facilities 100% Score: 29-100	1st Quartile (least ready) n=217, 26.1% Score: 29-62	2nd Quartile n=199, 23.9% Score: 63-78	3rd Quartile n=221, 26.6% Score: 79-92	4th Quartile (most ready) n=195, 23.4% Score: 93-100
Facility characteristics, n (%)					
Initial hospital trauma level					
I	166 (19.9%)	25 (11.5%)	24 (12.1%)	55 (24.9%)	62 (31.8%)
II	257 (30.9%)	52 (24.0%)	62 (31.2%)	79 (35.8%)	64 (32.8%)
III/IV	355 (42.6%)	140 (64.5%)	111 (55.8%)	78 (35.3%)	26 (13.3%)
Not applicable (pediatric only)	54 (6.5%)	0 (0.0%)	2 (1.0%)	9 (4.1%)	43 (22.1%)
Initial hospital pediatric trauma level					
I	84 (10.1%)	1 (0.5%)	5 (2.5%)	21 (9.5%)	57 (29.2%)
II	62 (7.5%)	3 (1.4%)	7 (3.5%)	25 (11.3%)	27 (13.8%)
III/IV	48 (5.6%)	12 (5.5%)	20 (10.1%)	13 (5.9%)	3 (1.5%)
Non-pediatric trauma	638 (76.7%)	201 (92.6%)	167 (83.9%)	162 (73.3%)	108 (55.4%)
Initial hospital trauma level or pediatric trauma level I or II	474 (57.0%)	77 (35.5%)	87 (43.7%)	142 (64.3%)	168 (86.2%)
Annual pediatric ED volume					
1 st quartile (1-4,900)	160 (19.2%)	51 (23.5%)	45 (22.6%)	41 (18.6%)	23 (11.8%)
2 nd quartile (4,900-8,400)	86 (10.3%)	19 (8.8%)	27 (13.6%)	21 (9.5%)	19 (9.7%)
3 rd quartile (8,400-13,800)	105 (12.6%)	13 (6.0%)	23 (11.6%)	36 (16.3%)	33 (16.9%)
4 th quartile (>13,800)	186 (22.4%)	9 (4.2%)	22 (11.1%)	67 (30.3%)	88 (45.1%)
Unknown	295 (35.5%)	125 (57.6%)	82 (41.2%)	56 (25.3%)	32 (16.3%)
Annual pediatric trauma volume (NTDB patients)					
1 st quartile (1-24)	212 (25.5%)	96 (44.2%)	63 (31.7%)	35 (15.8%)	18 (9.2%)
2 nd quartile (25-50)	203 (24.4%)	56 (25.8%)	54 (27.1%)	59 (26.7%)	34 (17.4%)
3 rd quartile (51-95)	210 (25.2%)	49 (22.6%)	57 (28.6%)	67 (30.3%)	37 (19.0%)
4 th quartile (96-1,045)	207 (24.9%)	16 (7.4%)	25 (12.6%)	60 (27.1%)	106 (54.4%)
Patients, n (%)	372,004 (100%)	36,171 (9.7%)	53,269 (14.3%)	86,470 (23.2%)	196,094 (52.7%)

eTable 4. Estimated annual number of lives saved among injured children by shifting their care from lower-readiness emergency departments (EDs) to high-readiness EDs.

% of patients shifted to highest quartile	<i>lowest</i> quartile ED readiness to highest quartile	<i>second</i> quartile ED readiness to highest quartile	<i>third</i> quartile ED readiness to highest quartile	<i>Across all quartiles</i>
	n lives saved per year (95% CI)	n lives saved per year (95% CI)	n lives saved per year (95% CI)	n lives saved per year (95% CI)
0% (no change)	0	0	0	0
25%	7 (5-8)	11 (9-13)	13 (9-18)	31 (23-38)
50%	13 (10-17)	23 (19-27)	27 (18-35)	63 (49-77)
75%	20 (15-25)	34 (28-40)	40 (27-53)	94 (72-116)
100%	27 (20-34)	46 (37-54)	53 (36-70)	126 (97-154)

*Because there was an uneven distribution of children who died across quartiles of ED pediatric readiness, the estimated number of lives saved differs across quartiles.

eTable 5. Stratified analysis by *transfer status* for the association between ED pediatric readiness, in-hospital mortality, and in-hospital complications.

	In-hospital mortality OR(95%CI)	p value for trend	Mortality or any complication OR(95%CI)	p value for trend
Non-transfer patients (n = 317,005)				
<i>ED pediatric readiness score:</i>				
1st Quartile (least ready)	referent	0.077	referent	0.481
2nd Quartile	1.34 (0.97-1.86)		1.15 (0.91-1.46)	
3rd Quartile	1.01 (0.74-1.36)		1.09 (0.88-1.35)	
4th Quartile (most ready)	0.69 (0.51-0.92)		0.91 (0.74-1.12)	
Transferred patients (n = 54,999)				
<i>ED pediatric readiness score:</i>				
1st Quartile (least ready)	referent	0.033	referent	0.646
2nd Quartile	0.99(0.65-1.49)		0.91(0.74-1.13)	
3rd Quartile	0.84(0.58-1.22)		0.97(0.78-1.20)	
4th Quartile (most ready)	0.59(0.39-0.90)		1.02(0.81-1.29)	

eTable 6. Stratified analysis by age group for the association between ED pediatric readiness, in-hospital mortality, and in-hospital complications.

	In-hospital mortality OR (95%CI)	<i>p</i> -value for trend	In-hospital mortality or any complication OR (95%CI)	<i>p</i> -value for trend
0-4 years (n= 97,431)				
<i>ED pediatric readiness score:</i>				
1st Quartile (least ready)	referent	0.006	referent	0.038
2nd Quartile	1.24 (0.72-2.13)		1.08 (0.77-1.52)	
3rd Quartile	0.93 (0.58-1.48)		1.02 (0.75-1.38)	
4th Quartile (most ready)	0.48 (0.31-0.76)		0.70 (0.51-0.96)	
5-12 years (n=130,614)				
<i>ED pediatric readiness score:</i>				
1st Quartile (least ready)	referent	0.018	referent	0.585
2nd Quartile	1.05 (0.61-1.80)		1.06 (0.74-1.51)	
3rd Quartile	0.83 (0.52-1.34)		1.09 (0.79-1.50)	
4th Quartile (most ready)	0.51 (0.32-0.82)		0.94 (0.67-1.30)	
13-15 years (n= 70,672)				
<i>ED pediatric readiness score:</i>				
1st Quartile (least ready)	referent	0.011	referent	0.396
2nd Quartile	1.13 (0.67-1.90)		1.07 (0.75-1.51)	
3rd Quartile	0.86 (0.53-1.39)		1.02 (0.75-1.39)	
4th Quartile (most ready)	0.49 (0.31-0.77)		0.86 (0.64-1.16)	
16-17 years (n= 73,287)				
<i>ED pediatric readiness score:</i>				
1st Quartile (least ready)	referent	0.843	referent	0.859
2nd Quartile	1.51 (1.01-2.25)		1.12 (0.87-1.44)	
3rd Quartile	1.14 (0.79-1.65)		1.14 (0.90-1.44)	
4th Quartile (most ready)	0.89 (0.62-1.29)		1.02 (0.81-1.28)	

eTable 7. Stratified analysis by calendar year for the association between ED pediatric readiness, in-hospital mortality, and in-hospital complications.

	In-hospital mortality OR (95%CI)	p-value for trend	In-hospital mortality or any complication OR (95%CI)	p-value for trend
Years 2012-2013* (n=125,991)				
<i>ED pediatric readiness score:</i>				
1st Quartile (least ready)	referent	0.025	referent	0.210
2nd Quartile	1.22 (0.76-1.95)		1.18 (0.88-1.60)	
3rd Quartile	0.95 (0.61-1.47)		1.11 (0.84-1.48)	
4th Quartile (most ready)	0.55 (0.36-0.86)		0.81 (0.61-1.09)	
Year 2014 (n=60,590)				
<i>ED pediatric readiness score:</i>				
1st Quartile (least ready)	referent	0.033	referent	0.765
2nd Quartile	1.04 (0.63-1.73)		1.06 (0.75-1.50)	
3rd Quartile	0.75 (0.48-1.19)		1.10 (0.81-1.50)	
4th Quartile (most ready)	0.54 (0.35-0.85)		1.03 (0.76-1.39)	
Year 2015 (n=60,442)				
<i>ED pediatric readiness score:</i>				
1st Quartile (least ready)	referent	0.004	referent	0.186
2nd Quartile	1.14 (0.69-1.88)		0.89 (0.61-1.28)	
3rd Quartile	1.07 (0.67-1.70)		1.03 (0.72-1.47)	
4th Quartile (most ready)	0.49 (0.31-0.78)		0.83 (0.59-1.17)	
Year 2016 (n=63,807)				
<i>ED pediatric readiness score:</i>				
1st Quartile (least ready)	referent	0.242	referent	0.392
2nd Quartile	0.93 (0.55-1.59)		0.84 (0.58-1.21)	
3rd Quartile	0.67 (0.42-1.08)		0.82 (0.61-1.11)	
4th Quartile (most ready)	0.67 (0.42-1.09)		0.87 (0.65-1.16)	
Year 2017 (n=61,174)				
<i>ED pediatric readiness score:</i>				
1st Quartile (least ready)	referent	0.085	referent	0.754
2nd Quartile	1.06 (0.62-1.80)		1.11 (0.77-1.60)	
3rd Quartile	0.81 (0.49-1.33)		1.05 (0.76-1.45)	
4th Quartile (most ready)	0.60 (0.37-0.95)		0.97 (0.69-1.35)	

*Data for calendar years 2012 and 2013 were combined to align with collection of data for the NPRP assessment of ED pediatric readiness.

eTable 8. Sensitivity analyses of emergency department pediatric readiness and in-hospital mortality, with the sequential addition of hospital-level variables and year in the model (n = 372,004).

	Primary model OR (95%CI)	Model 2 OR (95%CI)	Model 3 OR (95%CI)	Model 4 OR (95%CI)	Model 5 OR (95% CI)	Model 6 OR (95%CI)
<i>ED Pediatric Readiness Score</i>					OR (95% CI)	
1st quartile (least ready)	referent	referent	referent	referent	referent	referent
2nd quartile	1.16(0.87-1.54)	1.21(0.91-1.62)	1.23(0.93-1.63)	1.12(0.84-1.49)	1.16(0.87-1.54)	1.19(0.91-1.57)
3rd quartile	0.90(0.70-1.17)	1.03(0.79-1.33)	1.06(0.82-1.36)	0.85(0.66-1.11)	0.90(0.70-1.16)	1.09(0.85-1.39)
4th quartile (most ready)	0.58(0.45-0.75)	0.74(0.57-0.97)	0.75(0.58-0.98)	0.54(0.41-0.71)	0.58(0.45-0.75)	0.84(0.65-1.09)
Sex, Female	0.99(0.91-1.08)	0.99(0.91-1.08)	0.99(0.91-1.08)	0.99(0.91-1.08)	0.99(0.91-1.08)	0.99(0.91-1.08)
Age group						
0-4 years	1.37(1.22-1.55)	1.43(1.26-1.61)	1.42(1.25-1.60)	1.37(1.21-1.54)	1.37(1.22-1.54)	1.40(1.24-1.58)
5-12 years	1.35(1.20-1.51)	1.40(1.25-1.57)	1.39(1.24-1.56)	1.34(1.20-1.50)	1.35(1.21-1.52)	1.37(1.22-1.54)
13-15 years	1.02(0.91-1.15)	1.05(0.93-1.17)	1.04(0.93-1.17)	1.02(0.91-1.14)	1.03(0.92-1.15)	1.03(0.92-1.16)
16-17 years	referent	referent	referent	referent	referent	referent
Race						
White	referent	referent	referent	referent	referent	referent
Black	0.94(0.85-1.04)	0.94(0.86-1.04)	0.94(0.86-1.04)	0.94(0.85-1.04)	0.94(0.85-1.04)	0.96(0.87-1.06)
Asian	0.92(0.69-1.23)	0.93(0.69-1.24)	0.92(0.69-1.23)	0.92(0.69-1.23)	0.92(0.69-1.22)	0.95(0.71-1.26)
Other	1.22(1.10-1.36)	1.23(1.11-1.38)	1.22(1.10-1.36)	1.22(1.10-1.36)	1.23(1.10-1.37)	1.24(1.11-1.38)
Any comorbid condition	0.62(0.55-0.70)	0.62(0.55-0.70)	0.62(0.55-0.70)	0.62(0.55-0.7)	0.62(0.55-0.70)	0.62(0.55-0.70)
Injury mechanism						
GSW	4.68(3.99-5.48)	4.79(4.08-5.62)	4.65(3.97-5.45)	4.69(4.00-5.50)	4.70(4.01-5.50)	4.67(3.98-5.47)
Stabbing or other Penetrating injury	1.15(0.85-1.56)	1.15(0.85-1.56)	1.15(0.85-1.56)	1.15(0.85-1.56)	1.15(0.85-1.56)	1.15(0.85-1.55)
Burn, fire, flame	1.83(1.36-2.46)	1.87(1.39-2.54)	1.85(1.37-2.48)	1.83(1.37-2.46)	1.83(1.36-2.46)	1.87(1.39-2.51)
Assault	1.10(0.94-1.29)	1.11(0.94-1.30)	1.10(0.94-1.29)	1.10(0.94-1.29)	1.10(0.93-1.29)	1.10(0.93-1.29)
Fall	referent	referent	referent	referent	referent	referent
Motor vehicle	0.62(0.54-0.71)	0.61(0.53-0.70)	0.62(0.54-0.70)	0.62(0.54-0.71)	0.62(0.54-0.70)	0.62(0.54-0.70)
Bicycle	0.81(0.65-1.02)	0.80(0.64-1.00)	0.81(0.65-1.02)	0.81(0.65-1.01)	0.79(0.63-0.99)	0.81(0.65-1.02)
Pedestrian vs. auto	0.99(0.85-1.15)	0.98(0.84-1.14)	0.98(0.85-1.15)	0.99(0.85-1.15)	0.98(0.84-1.14)	0.99(0.85-1.15)
Other	1.40(1.23-1.61)	1.41(1.23-1.61)	1.41(1.23-1.61)	1.40(1.23-1.61)	1.42(1.24-1.63)	1.40(1.23-1.61)
Arrival by ambulance	0.97(0.85-1.09)	0.98(0.86-1.11)	0.98(0.86-1.11)	0.97(0.86-1.10)	0.96(0.85-1.09)	0.99(0.88-1.12)
Transfer to another hospital	0.35(0.30-0.40)	0.32(0.28-0.37)	0.33(0.29-0.38)	0.35(0.30-0.40)	0.35(0.30-0.40)	0.30(0.26-0.35)
Age-adjusted hypotension	5.33(4.72-6.02)	5.48(4.86-6.19)	5.32(4.71-6.00)	5.33(4.72-6.02)	5.28(4.68-5.97)	5.28(4.68-5.96)
GCS						

≤8	40.3(33.65-48.26)	42.41(35.38-50.84)	40.34(33.67-48.33)	40.40(33.70-48.42)	39.62(33.07-47.46)	40.60(33.91-48.61)
9-12	2.39(1.74-3.29)	2.38(1.73-3.28)	2.39(1.74-3.28)	2.39(1.74-3.29)	2.38(1.73-3.27)	2.40(1.74-3.30)
≥13	referent	referent	referent	referent	referent	referent
Injury Severity Score	1.05(1.04-1.05)	1.05(1.04-1.05)	1.05(1.04-1.05)	1.05(1.04-1.05)	1.05(1.04-1.05)	1.05(1.04-1.05)
Orthopedic surgery	0.62(0.56-0.68)	0.62(0.56-0.68)	0.62(0.56-0.68)	0.62(0.56-0.68)	0.62(0.57-0.69)	0.62(0.57-0.69)
Airway or ventilation support	2.66(2.26-3.12)	2.65(2.25-3.11)	2.65(2.26-3.12)	2.66(2.26-3.13)	2.68(2.28-3.14)	2.71(2.31-3.18)
Major non-orthopedic surgery	1.07(0.97-1.18)	1.07(0.97-1.18)	1.07(0.97-1.18)	1.07(0.97-1.18)	1.07(0.98-1.18)	1.07(0.98-1.18)
Blood transfusion (any)	2.42(2.18-2.67)	2.47(2.23-2.74)	2.42(2.19-2.68)	2.41(2.18-2.67)	2.45(2.22-2.72)	2.45(2.21-2.71)
Pediatric trauma center level						
I	-	referent	-	-	-	-
II	-	1.71(1.34-2.18)	-	-	-	-
III/IV	-	1.13(0.84-1.53)	-	-	-	-
Non-pediatric trauma	-	1.76(0.84-3.67)	-	-	-	-
Annual ED pediatric trauma volume						
1 st quartile (1-24)	-	-	1.75(1.22-2.52)	-	-	-
2 nd quartile (25-50)	-	-	1.99(1.56-2.54)	-	-	-
3 rd quartile (51-95)	-	-	1.38(1.11-1.72)	-	-	-
4 th quartile (96-1,045)	-	-	referent	-	-	-
Annual ED pediatric volume (all patients)						
1 st quartile (1-4,900)	-	-	-	0.79(0.61-1.04)	-	-
2 nd quartile (4,900-8,400)	-	-	-	1.00(0.75-1.34)	-	-
3 rd quartile (8,400-13,800)	-	-	-	1.07(0.84-1.35)	-	-
4 th quartile (>13,800)	-	-	-	referent	-	-
Year (continuous 2012-2017)					0.96 (0.94-0.98)	
Adult trauma center level						
I	-	-	-	-		referent
II	-	-	-	-		1.64(1.34-2.00)
III/IV	-	-	-	-		2.73(2.11-3.53)
Not applicable (pediatric only)	-	-	-	-		0.84(0.63-1.11)

Test for trend across aOR values for wPRS quartiles	<.001	.10	.09	<.001	<.001	.29
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GCS = Glasgow Coma Scale. Major non-orthopedic surgery included brain, spine, neck, chest, or abdominal operations. We measured ED pediatric readiness using the Weighted Pediatric Readiness Score (wPRS). The model also included region (data not shown).