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Pediatric trauma system models: do systems using adult trauma surgeons exclusively compare favorably with those using pediatric surgeons after initial resuscitation with an adult trauma surgeon?

P. J. Stiles, M.D.[a], Stephen D. Helmer, Ph.D.[a,b], Jeanette G. Ward, M.S.C.R.[c], Jared Reyes, M.Ed.[a], Paul B. Harrison, M.D.[d], James M. Haan, M.D.[a,c,*]

[a]Department of Surgery, The University of Kansas School of Medicine – Wichita, 929 N. Saint Francis St., Room 3082, Wichita, KS 67214, USA; [b]Department of Medical Education, Via Christi Hospital Saint Francis, 929 N. Saint Francis St., Room 3082, Wichita, KS, USA; [c]Department of Trauma Services, Via Christi Hospital Saint Francis, 929 N. Saint Francis St., Room 2514, Wichita, KS 67214, USA; [d]Department of Trauma Services, Wesley Medical Center, 550 N. Hillside, Wichita, KS 67214, USA

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Outcomes

Abstract

BACKGROUND: A shortage of pediatric surgeons exists. The purpose of this study was to evaluate pediatric outcomes using pediatric surgeons vs adult trauma surgeons.

METHODS: A review was conducted at 2 level II pediatric trauma centers. Center I provides 24-hour in-house trauma surgeons for resuscitations, with patient hand-off to a pediatric surgery service. Center II provides 24-hour in-house senior surgical resident coverage with an on-call trauma surgeon. Data on demographics, resource utilization, and outcomes were collected.

RESULTS: Center I patients were more severely injured (injury severity score = 8.3 vs 6.2; Glasgow coma scale score = 13.7 vs 14.3). Center I patients were more often admitted to the intensive care unit (52.2% vs 33.5%) and more often mechanically ventilated (12.9% vs 7.7%), with longer hospital length of stay (2.8 vs 2.3 days). However, mortality was not different between Center I and II (3.1% vs 2.4%). By logistic regression analyses, the only variables predictive of mortality were injury severity score and Glasgow coma scale score.

CONCLUSION: As it appears that trauma surgeons' outcomes compare favorably with those of pediatric surgeons, utilizing adult trauma surgeons may help alleviate shortages in pediatric surgeon coverage.

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* Corresponding author. Tel.: +1-316-268-5538; fax: +1-316-291-7892.
E-mail address: James.Haan.Research@viachristi.org

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There is a misallocation of, and overall shortage of, pediatric surgeons in the United States.[1] The vast majority of the pediatric surgery workforce practice in major metropolitan areas, leaving smaller communities underserved.[1] Also, there are many more adult surgeons in practice compared with pediatric surgeons. As an example, in 2011 the state of Kansas had .74 pediatric surgeons per 100,000 residents compared with 42 surgeons of any kind per 100,000 residents.[2] Thus, many communities that are short on fellowship trained pediatric surgeons use adult surgeons to care for pediatric patients.[1] Recent studies have suggested that using adult general surgeons to care for pediatric patients may not result in optimal care given the lower number of pediatric cases being performed by general surgery trainees.[3]

However, the American College of Surgeons (ACS) Committee on Trauma, the society charged with verifying pediatric trauma centers, recognizes that in some communities pediatric resources may be scarce. In those communities, "adult trauma centers, of necessity, may serve as the primary pediatric resource for the region and therefore may need to provide care for injured children."[4] In 2012, there were only 35 level I pediatric trauma centers in the United States, and 32 level II centers.[5]

To our knowledge, no study has directly compared pediatric surgeons with adult trauma surgeons in the care of pediatric trauma patients postresuscitation. Our primary objective was to first determine if the likelihood of mortality among the pediatric population is negatively affected by the use of adult trauma surgeons for postresuscitative care as compared with pediatric surgeons for postresuscitative care. Secondarily, we sought to determine if mortality among pediatric trauma patients could be predicted by variables available on presentation to the trauma center.

Methods

Patients and setting

A retrospective review was conducted at 2 geographically similar ACS-verified trauma centers. The trauma centers are both adult level I and pediatric level II centers, and are geographically only 2 miles apart. The trauma centers serve the same catchment area: northern Oklahoma and the majority of Kansas excluding the northeast corner of the state. Both hospitals are similar in size, availability of resources, and see a similar volume of pediatric patients. They also share some of the same pediatric surgical subspecialists including pediatric orthopedic surgeons and pediatric neurosurgeons. They differ, however, in type and structure of pediatric surgical coverage for their respective trauma centers. Center I

Table 1 Comparison of patient demographics, admission characteristics, and injury severity

Parameter*	Adult trauma service		Pediatric trauma service		*P* value
	N	Value	N	Value	
Number	465	47.5%	514	52.5%	–
Age (years)	465	8.1 ± 5.7	514	7.6 ± 5.8	.176
Male sex	465	304 (65.4%)	514	310 (60.3%)	.102
Race (Caucasian)	465	336 (72.3%)	514	460 (89.5%)	<.001
Uninsured	465	77 (16.6%)	506	14 (2.8%)	<.001
Transfer patient	464	197 (42.5%)	514	229 (42.5%)	.509
Mechanism					.006
Blunt mechanism	465	448 (96.3%)	514	467 (90.9%)	
Penetrating mechanism	465	12 (2.6%)	514	29 (5.6%)	
Drowning/burn	465	5 (1.1%)	514	18 (3.5%)	
Mean systolic blood pressure (mm Hg)	444	120.0 ± 21.7	504	117.5 ± 21.2	.078
Systolic blood pressure <90 mm Hg	444	21 (4.7%)	504	37 (7.3%)	.094
Heart rate	463	110.5 ± 29.9	514	112.2 ± 31.6	.396
Respiratory rate	462	22.9 ± 9.1	512	21.7 ± 9.0	.037
Temperature	451	98.5 ± 1.0	506	98.2 ± 1.2	<.001
Oxygen saturation	461	98.6 ± 2.0	510	98.2 ± 3.3	.169
ISS	465	6.2 ± 7.2	512	8.3 ± 8.3	<.001
ISS group					<.001
≤15	441	407 (92.3%)	499	421 (84.4%)	
16 to 24	441	15 (3.4%)	499	41 (8.2%)	
≥25	441	19 (4.3%)	499	37 (7.4%)	
GCS score	464	14.3 ± 2.5	501	13.7 ± 3.5	<.001
GCS score ≤8	464	26 (5.6%)	501	51 (10.2%)	.009

GCS = Glasgow coma scale; ISS = injury severity score.
*Data are presented as mean ± standard deviation or number (percent).