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Variability in the Characteristics and Quality of Care for Injured Youth Treated at Trauma Centers

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Abstract

Objective—To survey US Level I trauma centers in order to assess the characteristics of child and adolescent psychosocial service delivery.

Study design—Trauma program staff at US Level I trauma centers were asked to complete a survey regarding the characteristics and quality of service delivery for youth. The presence of pediatric services and screening of injured youth for alcohol use problems and posttraumatic stress disorder (PTSD) symptoms were assessed.

Results—150 of 202 (74%) of trauma centers responded to the survey. Substantial variability was observed in trauma center age cutoffs for pediatric and adolescent patients. Although the majority of sites endorsed having specialized pediatric, intensive care unit, and surgical services, marked differences were found in the reported percentage of youth receiving psychosocial services. Even though the majority of sites screened injured youth for alcohol use problems, variability was observed in the actual percentage of children and adolescents screened. Only 20% of sites endorsed specialized PTSD services.

Conclusions—Our investigation observed marked variability across trauma centers in the delivery of child and adolescent services. Future research could develop high quality pediatric psychosocial services in order to inform trauma center standards nationwide.

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Keywords

Quality of Care; Children; Adolescents; Psychiatry; PTSD; Alcohol

Traumatic physical injury is a leading cause of death, disability, medical costs, and health service utilization among youth in the United States (US).¹⁻⁵ Estimates suggest that over 150,000 injured patients under the age of 18 are discharged from US hospitals each year.⁶⁻⁸ Only 10% of injured youth are hospitalized at children's hospital-based pediatric specialty trauma centers.^{9, 10} A limited number of investigations have focused on comparisons of surgical outcomes, such as mortality, and the presence of appropriate operative procedures at pediatric specialty versus non-specialty centers.¹⁰⁻¹² Few investigations, however, have comprehensively evaluated the characteristics and quality of care for injured children and adolescents treated at trauma centers.

A recent conference on pediatric trauma care^{4, 6, 13} reported that the mortality rate of hospitalized pediatric trauma patients is only 1-2%.⁶ An understanding of the resources required to inform family-centered and psychosocial care were key elements of trauma care quality improvement^{4, 6, 13}. The conference recommended in-depth investigation of variations in the characteristics and quality of child and adolescent trauma care that can potentially inform quality improvements within the context of the resources available to local trauma care systems.⁴

The conference proceedings complement recent recommendations from the Institute of Medicine regarding the prevention of emotional and behavioral disorders in youth.^{3, 14} Previous research suggests that psychosocial care at trauma centers deserves comprehensive investigative focus, given the frequent occurrence of posttraumatic stress disorder (PTSD) symptoms and high-risk behaviors such as alcohol consumption among admitted youth.¹⁵⁻¹⁷ Literature review revealed few investigations, however, of the quality of psychosocial care delivery for children and adolescents at US trauma centers.^{18, 19}

Our overarching goal was to survey US Level I trauma centers nationally in order to assess the characteristics of child and adolescent psychosocial service delivery. A secondary goal was to compare aspects of psychosocial care delivery between pediatric specialty and non-specialty centers. Data on the variability in care for children and adolescents treated at centers across the nation has been previously unavailable and is vital for planning future investigations of screening and intervention procedures, and for the creation of policy standards.²⁰

METHODS

The study procedures were approved by the University of Washington Institutional Review Board prior to protocol implementation. The population of interest was all Level I trauma centers in the US that were certified by a government body or were verified by the Committee on Trauma of the American College of Surgeons between October, 2007 and September, 2009. Trauma centers in the US were identified through a review of the American College of Surgeons listing of verified trauma programs, the American Trauma Society's Information Exchange information system, and other web-based searches.²¹ Information on hospital accreditation, academic affiliation, and bed number were obtained from American Hospital Directory listings and through review of individual hospital web pages. Children's hospital-based pediatric specialty sites were identified through information contained in these sources.

Data from the listings and web-based searches were utilized in conjunction with hospital web-sites to identify potential trauma program survey responders. Trauma program coordinators were identified, contacted, and, after providing informed consent, had the option of completing web-based ($n = 102$, 68%) or, hard copy (mailed ($n = 29$, 19%) or faxed ($n = 19$, 13%)) questionnaires. The median number of contacts required before survey completion was 6 (range = 1–14). Each respondent was reimbursed \$20 after completion of the questionnaire.

Questionnaire Items

Based on prior nationwide trauma center surveys developed by our group, a questionnaire was developed to assess the characteristics and quality of child and adolescent service delivery at Level I trauma centers. The global survey of trauma center psychosocial care contained 38 items including the 13 embedded pediatric items. The entire questionnaire required approximately 20 minutes to complete.

Initial items assessed age criteria used at the institution to define the treatment of child and adolescent patients. Subsequent items assessed the presence and characteristics of pediatric wards in which injured children were hospitalized; whether or not the trauma center had a separate pediatric intensive care unit (PICU), a distinct surgical service led by a pediatric surgeon; and a pediatric service that provided care to injured children and adolescents. Additional survey items assessed the presence and nature of pediatric psychosocial services dedicated to alcohol and PTSD screening and intervention. Final questions assessed the background of the respondent (e.g., position and years at the trauma center, professional degree).

Data Analyses

We first examined the frequencies and distributions of organizational characteristics for all 202 US Level I trauma centers and compared the characteristics of responding and non-responding centers. Next, we examined the frequencies and distributions of trauma center responses to survey items. Finally, we compared the responses of pediatric specialty versus all other trauma centers and used the Mann-Whitney U test to assess for statistically significant differences.

RESULTS

Surveys were completed between 10/27/2007 and 8/10/2009, with 75% responses occurring by 12/30/2008. Of the 202 centers contacted, 150 completed the survey, for a response rate of 74.3%. Of the 20 children's hospital based pediatric specialty centers, 15 (75%) responded to the survey (Table I). The majority of trauma program respondents were nurses (79%). Other respondents included physicians (9%) or other trauma center providers (8%) (e.g., MSW); 4% of respondents were missing data on provider background. The mean time since graduation from medical training was 19.9 years ($SD = 9.7$), and the mean number of years employed at the trauma center was 12.6 ($SD = 8.9$).

Care and Placement of Pediatric Trauma Patients

Over three-quarters of responding centers ($n = 116$, 77.3%) reported caring for pediatric patients. The age criteria used to define pediatric patients varied widely (Table II). The median upper age used to define pediatric patients was 15 (IQR = 3). The median number of pediatric trauma patients admitted annually was 250 (IQR = 329), although children's hospital pediatric specialty centers had significantly greater annual volume of pediatric patients (median = 875, $P < 0.001$). Three of the 15 designated pediatric trauma centers hospitalized patients ages 18 and older on the same ward as pediatric trauma patients; 65%

of centers had a separate PICU, and 59.3% had a distinct pediatric surgical service led by a pediatric surgeon. Children's hospital pediatric specialty sites were significantly more likely to report having a PICU (93% versus 62%, $P < 0.05$), and a pediatric surgical service (93% versus 56%, $P < 0.01$) when compared with non-specialty sites.

Care and Placement of Adolescent Trauma Patients

Eighty-seven percent ($n = 131$) of responding centers reported caring for injured adolescent patients. The age cutoff used to define adolescents varied markedly (Table II). The median upper age used to define adolescent patients was 16 (IQR = 3). The median number of adolescents treated annually was 110 with no significant differences between pediatric specialty sites (median = 125) and non-pediatric (median = 110) sites.

Pediatric Services for Injured Children and Adolescents

Approximately two-thirds of sites ($n = 99$, 66%), endorsed having a pediatric service available to help care for pediatric patients. The upper age limit used to demarcate pediatric versus other medical services varied across sites (Table II); the median upper age criteria was 17 (IQR = 1). Less than one-half (41%) of centers reported having pediatricians available for adolescent trauma patients.

Child and Adolescent Alcohol & PTSD Screening and Intervention

Approximately one-quarter of centers reported having a specialist who routinely screened and intervened with pediatric trauma patients for alcohol use problems (Table III). Screening was usually done by the same person who screened adults for alcohol problems, although use of a substance abuse specialist for alcohol screening and counseling was uncommon. Trauma centers reported that social workers (53%), psychologists (26%), nurses (16%), psychiatrists (18%), and chemical dependency counselors (8%) performed alcohol screening and intervention. Also, trauma centers reported that social workers (40%), psychologists (33%), nurses (3%), psychiatrists (33%), and other providers (10%) performed PTSD screening and intervention.

DISCUSSION

Quality of care criteria globally, and in the specific case of trauma care systems, rely on the standardization of definitions and procedures.^{3, 14, 20} The current investigation highlights the marked variability in age cutoffs used to define pediatric and adolescent patients and the reported heterogeneity in services available. Thus, a key tenet of quality criteria, standardization, does not appear to be occurring for pediatric patients at Level I trauma centers in the US. This variability can be seen to constitute a major impetus for enhanced coordination of research and policy dialogues targeting quality of care enhancements for child and adolescent patients at the nation's trauma centers.^{4, 6, 13}

The observation of little agreement on the upper age used to define a "pediatric" patient at trauma centers is of particular concern. It is well documented that injured pediatric patients have special needs.³ Beyond pediatric injury, adolescents have distinct developmental issues that are physiologically and psychologically different from younger children and adults.²² Prior investigation suggests that the distinct needs of adolescents may require specialized trauma center psychosocial resource development.^{16, 23} In addition, by separating out the adolescent end of the pediatric age range and treating these patients in an exclusively adult setting, the goal of achieving adequate volumes of pediatric trauma at an institution is further threatened.

The current investigation provides new data on the number of Level I trauma centers caring for children and adolescents as well as patient volumes. Although there are a large number of institutions caring for children and adolescents, the individual institutional volume of cases is relatively low. In this study 116 Level I trauma centers reported treating pediatric patients, with a median of 250 cases at each site. Nance et al²⁴ identified 170 pediatric trauma centers, based on data from the American College of Surgeons, the American Trauma Society, and the National Association of Children's Hospitals and Related Institutions. However, this includes both verified and self-designated centers. Segui-Gomez⁹ found that 87% of hospitals treating injured children in the US were non-trauma centers for either adults or children. For adult trauma, there is good evidence that volume of patients treated annually matters.²⁵ The lower number of serious pediatric trauma compared with that involving adults, combined with the large number of institutions caring for injured children suggests that substantially more regionalization of pediatric trauma care for seriously injured children is needed.

Because of the growing body of literature suggesting PTSD and alcohol use problems are prevalent conditions among injured youth, the investigation assessed screening and intervention practices for these disorders at Level I trauma centers.^{15–17} Although the majority of sites screened injured youth for alcohol use problems, marked variability was observed in the actual percentage of children and adolescents screened. Only 20% of sites endorsed having specialized PTSD screening and intervention services available for injured youth. A heterogeneous group of providers conducted the screenings including social workers, psychologists, nurses, and psychiatrists. Future randomized clinical trial investigations could assess the outcomes of model trauma center programs targeting PTSD and alcohol screening and intervention in injured youth.

Certain limitations of the study must be considered. The information was obtained from trauma program coordinators and not from directors of trauma or pediatrics at these institutions. We were not able to follow-up the survey with questions for pediatricians, pediatric surgeons, and pediatric ICU providers. However, these were senior level coordinators who on average had worked for the institution for more than a decade and would have been familiar on a daily basis with the care delivered at the trauma centers. An additional limitation of the investigation is that the survey did not assess reasons why some trauma centers did not report routinely screening adolescents for alcohol, despite the existence of the American College of Surgeons' alcohol screening requirement. The survey also did not include more in-depth questions regarding services for PTSD screen positive patients, and in house versus transfer services for pediatric rehabilitation. Finally, the psychometric characteristics of the questionnaire employed in the investigation have not been meticulously evaluated.

Beyond these considerations, this investigation documents marked variability in the characteristics of pediatric psychosocial services delivered at US Level I trauma centers. Future research could systematically evaluate how this variability in child and adolescent trauma center service delivery impacts pediatric functional and symptomatic outcomes after injury. These efforts could productively occur in concert with the expansion of trauma center organizational capacity for sustainable pediatric service improvement initiatives.^{20, 21}

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Abbreviations

US	United States
IQR	Interquartile range
PTSD	Posttraumatic Stress Disorder

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Table I

Organizational characteristics of responding and non-responding US Level I trauma centers (N= 202)

Characteristics	All (N=202)	Responding (n=150)	Non-Responding (n=52)
	n (%)	n (%)	n (%)
ACS accredited*	114 (56.4)	92 (61.3)	22 (42.3)
<i>Region of country*</i>			
Midwest	64 (31.7)	47 (31.3)	17 (32.7)
South	57 (28.2)	40 (26.7)	17 (32.7)
Northeast	49 (24.3)	32 (21.3)	17 (32.7)
West	32 (15.8)	31 (20.7)	1 (1.9)
Rural status	28 (13.9)	19 (12.7)	9 (17.3)
<i>Population served</i>			
Peds	20 (10.3)	15 (10.3)	5 (10.2)
Adult/Peds	85 (43.6)	63 (43.2)	22 (44.9)
Adult	90 (46.2)	68 (46.6)	22 (44.9)
Teaching hospital*	190 (95.0)	144 (97.3)	46 (88.5)
Council of teaching hospitals	150 (78.5)	113 (79.0)	37 (77.1)
University affiliation	156 (78.0)	116 (77.3)	40 (80.0)
	Mean (SD)	Mean (SD)	Mean (SD)
No. of interns/residents	256 (179)	247 (158)	285 (236)
No. of hospital beds	575 (266)	554 (224)	638 (360)

*Indicates $P < 0.05$ for the comparisons. All other comparisons are non-significant

Table II

Characteristics of pediatric and adolescent trauma patients and services at US Level I trauma centers (n =150)

Variable	Trauma Center n	%
Separate pediatric ward	111	74
Pediatric and adult patients hospitalized on same ward	36	24
Pediatric consult services available for adolescents	62	62
<i>Location of adolescent trauma patients[‡]</i>		
Pediatric ward	76	51
Adult ward	91	61
Other	21	14
<i>Age used to define "pediatric" trauma patients</i>		
≤12	11	7
≤13	5	3
≤14	28	19
≤15	29	19
≤16	13	9
≤17	13	9
≤18	15	10
≤19	8	5
Missing	28	19
<i>Age cutoff used to define "adolescent" trauma patients</i>		
13	11	7
14	5	3
15	28	19
16	29	19
17	13	9
No adolescent criteria	36	24
Missing	28	19
<i>Age criteria use to define oldest pediatric consult case</i>		
12	1	1
13	3	3
14	7	7
15	3	3
16	8	8
17	14	14
18	34	34
≥19	21	21
Missing	8	8
	Median*	IQR*
Number of pediatric trauma ward beds	32	40
Percent of pediatric trauma center admissions hospitalized on pediatric ward	95	20
Percent of adolescents hospitalized in adult wards	40	95

Variable	Trauma Center n	%
Percent of children seen by pediatric consult	50	90
Percent of adolescents seen by pediatric consult	15	85

IQR, Interquartile range.

* Median and IQR are percentages between 0–100.

† Percentages may add up to more than 100.

Table III

Alcohol and posttraumatic stress disorder screening and intervention services for pediatric and adolescent patients at Level I trauma centers (n = 150)

Variable	n	%
Pediatric patients screened for alcohol problems	39	26
Adolescent patients screened for alcohol problems	81	54
Specialized consultant for alcohol counseling	38	25
Same person who screens/treats adults	23	61
Specialized consultant for PTSD screening/intervention	30	20
Same person who screens adults for PTSD	15	50
	Median*	IQR
Pediatric median percent regularly screened for alcohol	63	86
Adolescent median percent regularly screened for alcohol	80	60

IQR, Interquartile range.

*Median and IQR are percentages between 0–100.