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**Pediatric Care as Part of the US Army Medical Mission in the Global War on
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Pediatric Care as Part of the US Army Medical Mission in the Global War on Terrorism in Afghanistan and Iraq, December 2001 to December 2004

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ABSTRACT

OBJECTIVE. Our objective in this report was to describe the epidemiologic features of and workload associated with pediatric admissions to 12 US Army military hospitals deployed to Iraq and Afghanistan.

METHODS. The Patient Administration Systems and Biostatistics Activity database was queried for all local national patients <18 years of age who were admitted to deployed Army hospitals in Afghanistan and Iraq between December 2001 and December 2004.

RESULTS. Pediatric admissions during the study period were 1012 (4.2%) of 24 227 admissions, occupying 10% of all bed-days. The median length of stay was 4 days (interquartile range: 1–8 days). The largest proportion of children were 11 to 17 years of age (332 of 757 children; 44%), although 45 (6%) of 757 children hospitalized were <1 year of age. The majority (63%) of pediatric patients admitted required either general surgical or orthopedic procedures. The in-hospital mortality rate for all pediatric patients was 59 (5.8%) of 1012 patients, compared with 274 (4.5%) of 6077 patients for all adult non-US coalition patients.

CONCLUSIONS. Pediatric patients with injuries threatening life, limb, or eyesight are part of the primary responsibility of military medical facilities during combat and have accounted for a significant number of admissions and hospital bed-days in deployed Army hospitals in Afghanistan and Iraq. Military medical planners must continue to improve pediatric medical support, including personnel, equipment, and medications that are necessary to treat children injured during combat operations, as well as those for whom the existing host nation medical infrastructure is unable to provide care.

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Key Words

combat, war, trauma, pediatric

Abbreviations

FST—forward surgical team

CSH—combat support hospital

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IN WARTIME, CHILDREN are injured and killed. This tragedy is neither new nor unique to the current conflicts in Afghanistan and Iraq. The circumstances and conduct of this war are unique, however, because the strategy for the war calls for more than the destruction of a fixed definable enemy. The US national security strategy includes “expanding the circle of development” by working with the governments to, among other things, “invest in health care.”^{1,2} Pediatric patients represent significant proportions of the health care needs in Afghanistan and Iraq, and their treatment must be included if this national security strategy is to be successful.

When large-scale conflict has ended but security for civilians cannot be guaranteed, nation-building responsibilities that normally would be met by civilian governmental and nongovernmental organizations fall to the uniformed services by necessity.³ The same military forces that are engaged in combat one day must maintain stability the next day, while supporting and coordinating with civilian agencies attempting to do the same. Although it is a natural extension of the execution of war to address the inevitable associated human suffering, this is not a function that the military, an organization whose focus is to defeat an enemy swiftly, has consistently performed well.^{3–6}

The present conflicts in Afghanistan and Iraq are unique for the US military health care system. This comprehensive system is designed and resourced to care for sick and wounded adult combatants, from the point of injury

back to the continental US and large rehabilitation hospitals. In these conflicts, however, the military health care system has played a significant role in stability, support, and "nation building." This new role has become particularly clear with respect to the care of hospitalized pediatric patients and raises questions regarding the doctrine and mission of the US military health care system. Our objective in this study was to describe the epidemiologic features of and workload associated with pediatric admissions to deployed US Army hospitals during the first 3 years of combat operations in Afghanistan and Iraq.

In the autumn of 2001, the US military launched Operation Enduring Freedom in Afghanistan. Medical personnel were deployed to Afghanistan and neighboring Uzbekistan, first as small forward surgical teams (FSTs) and then as mobile hospital units, most commonly in the form of combat support hospitals (CSHs). A FST typically is assigned 1 orthopedic surgeon and 2 or 3 general surgeons, with 8 postoperative beds. CSHs may have 8 to 10 surgeons assigned, with up to 236 beds. The primary mission of each of these units is to provide stabilizing care (eg, damage-control surgery), and in some cases definitive care, to US military personnel who become ill, wounded, or injured and to provide treatment for all non-US casualties with injuries threatening life, limb, or eyesight. Humanitarian aid, defined as care provided to non-US personnel without injuries threatening life, limb, or eyesight is also commonly provided by US military medical personnel. The humanitarian care delivered is diverse and includes inpatient care within military medical facilities and outpatient care, most often in the form of mobile clinics in remote villages.

By the autumn of 2002, pediatric inpatients were becoming increasingly common at the Army CSH located at Bagram, Afghanistan. Many of the children were victims of land mines that remained after decades of war. With the onset of Operation Iraqi Freedom in the spring of 2003, injured Iraqi children received care in US military hospitals in Iraq and on the USNS *Comfort*, in the Persian Gulf. Of the 630 wartime anesthetic procedures performed on the *Comfort*, 45 (7%) were for children.⁷ As Operation Iraqi Freedom progressed, military personnel continued to provide care to increasing numbers of children with traumatic injuries or with severe medical conditions, which were treated for humanitarian reasons.

We examined the collected data to determine the proportions of the admitted patient populations represented by neonatal and pediatric patients. These data were compiled initially by patient administration staff members at the local hospital level and then were transferred to the Patient Administration Systems and Biostatistics Activity, located at Fort Sam Houston (San Antonio, TX).

METHODS

We queried the Patient Administration Systems and Biostatistics Activity database for all patients <18 years of age who were admitted to 12 deployed Army hospitals

in Afghanistan and Iraq between December 2001 and the end of December 2004. The patients included in this database had traumatic injuries that were combat-related or non-combat-related, in addition to patients with medical conditions who were transferred from host nation facilities for humanitarian care. These categories of cause of admission were not captured in the database. Data on age and primary diagnosis at the time of admission were collected. Data on length of hospital stay and mortality rates were collected for both pediatric and adult patients. Pediatric patients were defined as those ≤ 17 years of age. Adult patients were defined as those ≥ 18 years of age and were separated into the following categories: US coalition personnel, enemy combatants, local nationals (Afghani and Iraqi civilians and military personnel), and foreign civilian contract personnel. Data were not available for patients who died en route and before admission. Data on patient age and primary subspecialty services provided were available for only 757 of 1012 patients included in the analysis.

Patient data were analyzed and categorized geographically and demographically. On the basis of the primary diagnosis for admission, a surgeon and a pediatrician (both with deployment experience) determined the primary care service that likely provided care. Length of stay represented the number of days that a pediatric patient occupied a bed in the deployed hospital. The demands placed on the facilities by these pediatric "bed-days" were compared with those created by the overall patient census.

Nonparametric data are presented as median and interquartile range. The Wilcoxon rank-sum test was used for comparison of nonparametric continuous data. The χ^2 test or Fisher's exact test was used for comparisons of categorical data, as indicated. Significance for all comparisons was set at $P < .05$. Statistical analyses were performed with SPSS 13.0 (SPSS, Chicago, IL).

RESULTS

During the period from December 2001 to December 2004, 24 227 patients with traumatic and nontraumatic conditions were admitted to deployed Army hospitals in Afghanistan and Iraq. Table 1 displays the proportion admitted, length of stay, and median percentage of hospital bed-days for each personnel category recorded during the study period.

Of the 24 227 patients admitted during the study period, 1012 patients (4.2% of total) were children. Deployed hospitals in Afghanistan admitted 611 (60%) of the 1012 children, with the remaining 401 (40%) being admitted in Iraq. Data on age and reason for admission were available for 757 pediatric admissions. The largest proportion of children were 11 to 17 years of age (332 of 757 children; 44%), although 45 (6%) of 757 children were <1 year of age (Table 2). The diagnostic categories or medical services required at admission for pediatric patients were orthopedic (245 of 757 children; 32%), general surgical (232 of 757 children; 31%), medical (136 of 757 children; 18%), neurosurgical (60 of 757 children; 8%), ear/nose/throat (36 of 757 children; 5%), and ophthalmologic (41 of 757 children;

TABLE 1 Proportions of Patients, According to Type and Age, Admitted to US Army Military Treatment Facilities in Afghanistan and Iraq Between December 2001 and December 2004

Category	Frequency and Proportion of Patients, n/N (%)	Length of Stay, Median (Interquartile Range), d	Median Proportion of Hospital Bed-Days, n/N (%)
US coalition forces	17 125/24 227 (70.7)	1 (1–3)	17 125/39 924 (42.9) ^a
Adult local nationals	3085/24 227 (12.7)	3 (1–7)	9255/39 924 (23.2) ^b
Adult enemy combatants	1743/24 227 (7.2)	4 (2–10)	6972/39 924 (17.5) ^c
Pediatric patients	1012/24 227 (4.2)	4 (1–8)	4048/39 924 (10.1) ^d
Adult foreign civilian contract employees	1249/24 227 (5.2)	2 (1–3)	2498/39 924 (6.3) ^e
Other	13/24 227 (0.1)	2 (1–3)	26/39 924 (0)

^{a–e} Values with different superscripts are significantly different ($P < .05$).

5%). The most common group of diagnoses for pediatric patients admitted to US Army hospitals were closed fractures (12%), followed by burn injuries (10%) and open fractures (9%). Medical diagnoses were varied and included meningitis, neoplasms, and cardiac arrhythmias. In addition, 3 live births occurred in US Army hospitals during the study period.

In both Afghanistan and Iraq, the median length of stay was 4 days (interquartile range: 1–8 days) for pediatric patients (Table 1). When length of stay was accounted for, pediatric patients filled 10% of all occupied beds during the period studied. The Army hospitals in Afghanistan alone reported that 611 (15%) of 4050 total admissions were for infants and children. When the longer average hospital stay was taken into account, pediatric patients occupied 4787 (25%) of 19 418 filled bed-days in these facilities. The inpatient mortality rate for all pediatric patients in both Afghanistan and Iraq during the time period of this study was 5.8% (59 of 1012 patients), which was similar to the mortality rate for all adult, non-US coalition patients, that is, 4.5% (274 of 6077 patients; $P = .07$).

One of the busiest medical facilities during this period was the Baghdad section of the 31st CSH. Pediatric admissions in Baghdad also made up a significant proportion of the total patient workload, that is, 836 (6%) of 14 464 occupied bed-days and 482 (12.4%) of 3887 occupied ICU bed-days. Almost one half (51 of 105 children; 49%) of these children had been seen at lower echelons of Army medical care (aid stations) before referral to the 31st CSH in Baghdad. The mortality rate for pediatric patients at this CSH was 10 (9.5%) of 105 patients.

TABLE 2 Proportions of Pediatric Patients, According to Age, Admitted to US Army Medical Treatment Facilities Deployed in Afghanistan and Iraq

Age Group	Proportion of Patients Admitted to Deployed US Army Medical Treatment Facilities, n/N (%)
<1 y	45/757 (6)
1–5 y	147/757 (19)
6–10 y	230/757 (30)
11–17 y	332/757 (44)
Unknown	3/757 (<1)

Data on age were available for only 757 of 1012 patients.

DISCUSSION

To our knowledge, this is the largest epidemiologic or observational study in the literature of children treated at deployed military hospitals during combat operations. Pediatric patients accounted for 4.2% of all hospital admissions to deployed Army military treatment facilities in Afghanistan and Iraq between December 2001 and December 2004. More importantly, children represented 10% of all hospital bed-days, which is a more-accurate reflection of patient workload.

The results are even more striking in examination of the data from Afghanistan, where the medical infrastructure was so rudimentary that it prevented patient transfers to local hospitals. In Operation Enduring Freedom, 15% of the admissions were pediatric and children accounted for one fourth of the occupied bed-days. In addition to treatment at deployed hospitals, pediatric patients were cared for at smaller, more-forward units, such as FSTs and augmented medical companies, in both Afghanistan and Iraq. This is supported by the experience reported by a FST operating in southern Afghanistan, where 22% of their 90 surgical patients were children.⁸ Other reports also supported the notion that pediatric care is common in military treatment facilities in Iraq.⁹ In our study, 50% of pediatric patients who were transferred to the 31st CSH in Baghdad in 2004 were treated initially at smaller military facilities. The reality that children are being resuscitated initially at lower levels of care than CSHs indicates that these treatment facilities must also be equipped to provide care to this special population. Although the number of pediatric patients cared for as outpatients or on humanitarian aid missions in small towns and villages by US Army medical personnel has not been recorded, it is our estimation that thousands of children received this type of primarily non-trauma-related medical assistance during the study period.

The similarity in mortality rates for children, compared with all adults admitted to military medical facilities, is a testament to the dedication and commitment of the military providers at these deployed hospitals. The 12 military treatment facilities included in this study rarely had personnel trained in pediatrics, such as physicians, nurses, or respiratory therapists, assigned to them during the study period. The lack of personnel trained in pediatrics was compensated for by a strong desire to achieve the best outcomes possible for these

children, collaboration between specialists in theater on difficult cases, and consultation with experts in the United States via cellular telephones and the Internet.

The US Army recognizes stability operations as the application of military power to influence the political environment to enhance a government's willingness and ability to care for its people.¹⁰ In Department of Defense Directive 3000.05, published in November 2005, it was noted that "stability operations are a core US military mission . . . given priority comparable to combat operations."¹¹ Support operations provide supplies and services to assist governments in relieving suffering and responding to crises.¹² Currently, the Army is not specifically organized, trained, or equipped for support operations. Instead, the forces are designed and organized for warfighting. However, the Army's warfighting capabilities make it particularly well suited to achieve success in support and stability operations. The Army Operations Field Manual describes the Army as a disciplined force with well-established, flexible, and adaptable procedures, a functional chain of command, and reliable communications that can operate and sustain itself in austere environments with organic assets.⁶ The Field Manual also states that the Army can rapidly move large forces to affected locations by using military transportation and the Army engineer, military police, medical, transportation, aviation, and civil affairs assets are especially valuable for support operations.⁶ The care of children on the battlefield as part of stability or support operations has not been a consistent priority in planning or preparation, despite previous military experiences.

Infant mortality rates in both Afghanistan and Iraq are among the highest in the world. The preconflict infant mortality rate in Afghanistan in 2000 was 165 deaths per 1000 and that in Iraq in 2002 was 102 deaths per 1000 (in contrast to rates of 7 deaths per 1000 in the United States and 5 deaths per 1000 in the United Kingdom). The <5-year-old mortality rates were 257 deaths per 1000 in Afghanistan and 125 deaths per 1000 in Iraq (in contrast to 8 deaths per 1000 in the United States and 6 deaths per 1000 in the United Kingdom).¹³ These stark reflections of abysmal health care for children provide a daunting challenge for affecting the health care systems in these 2 nations.

Uniformed pediatricians are well suited to deliver troop and emergency resuscitative trauma care. These specialists are trained extensively in the health care of adolescents and young adults up to 24 years of age, an age range that represents 42% of active duty Army personnel (204 689 of 493 615 personnel).¹⁴ Well over one third of all Army pediatricians (72 of 207 pediatricians) were deployed to Southwest Asia during this period, most providing initial care to patients in a pre-hospital environment.¹⁵ There are many similarities between the resuscitative skills used routinely in the delivery room and those used in trauma resuscitation. Pediatricians spend more time training in critical care and postoperative surgical management than other primary care specialists, and pediatrician graduates of military programs are trained specifically in humanitarian

assistance and disaster management. Pediatricians have played a key role in the education of Iraqi physicians, teaching the first Pediatric Advanced Life Support course and the first Neonatal Resuscitation Program in Iraq.¹⁶

It may well be time for uniformed military forces in every nation to examine doctrine and training, to better prepare for the care of children with severe traumatic injuries sustained during combat, as well as non-combat-injured and ill children who have nowhere else to go for care. History indicates that children will always need to be cared for during combat. Previous reports from the Vietnam War and the Persian Gulf War have documented this well, ushering in a decade of military humanitarianism and establishing the US military as cooperating experts in humanitarian disaster relief.^{4,5,17} Improvement in the use of pediatrics-trained personnel, pediatric medications, and pediatric equipment has been called for by service members deployed in both Afghanistan and Iraq.^{8,9,18,19} The US Army Medical Command response to the increased load of pediatric patients has included pediatrics-specific trauma training for all hospital personnel before deployment; development and support of a pediatric critical care telemedicine service that provides immediate access via telephone to a pediatric intensivist or neonatologist at all times and that is available to all deployed physicians; development of a complete pediatric medical supply and medication package that augments the supplies of military medical treatment facilities; and deployment of pediatricians and pediatrics-trained personnel to the busiest CSHs.

Pediatric support since the beginning of the conflicts in both Afghanistan and Iraq has improved for deployed hospitals. It must be maintained and even augmented if necessary to achieve success in support and stability operations (nation building). Improved support at lower levels of care is still needed to provide pediatric supplies and training. Providing care to severely injured pediatric patients is included in our primary mission of caring for all patients with life-, limb-, and eyesight-threatening injuries and is our responsibility. We must give our providers the tools required to accomplish this goal. The value of winning hearts and minds with the treatment of children is an additional gain that in many ways prevents future injuries in all populations, as a result of increased cooperation between local civilians and coalition forces. There are many anecdotal reports and it is the experience of one author (Dr Spinella) that the care provided to just one child can affect an entire village's perception of the coalition (to the extent that civilians provided information that led directly to the capture of numerous insurgents).

Writing after the destruction of Hiroshima, Japan, by a nuclear weapon in 1945, Dr Hachiya Michihiko commented on the impact of military doctors who assisted him in the treatment of the Japanese civilians wounded and sickened by the bomb. "They gave us great help, materially and spiritually in the reconstruction of our hospital. Two doctors removed fear and hostility from our hearts and left us with a bright, new hope. The harsh winter that followed the autumn was less harsh for their having come."²⁰ Perhaps in participating in the care of

the children in Iraq and Afghanistan, we can soften the harshness there as well.

CONCLUSIONS

Life-, limb-, and eyesight-threatening injury treatment, in addition to humanitarian medical assistance, commonly is required for children during combat operations. Pediatric support at deployed hospitals has improved greatly since the beginning of the war in Afghanistan. Similar support must now be provided to the facilities that provide lower levels of care, because children commonly are resuscitated initially in these facilities. We have moral, ethical, and doctrinal obligations to care for seriously injured and ill children in times of war.

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