

“Operation Child-Safe”: A Strategy for Preventing Unintentional Pediatric Injuries at a Hurricane Katrina Evacuee Shelter

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Abbreviations:

IRB = Institutional Review Board
MRC = Medical Reserve Corps
OSDH = Oklahoma State Department of Health
PIRT = Pediatric Injury Response Team
SKTA = Safe Kids Tulsa Area

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Abstract

Introduction: Children represent a vulnerable population, and special considerations are necessary to care for them properly during disasters. Comprehensive disaster responses include addressing the unique needs of children during mass-casualty incidents, such as the prevention of unintentional injuries. Early in the morning of 04 September 2005, approximately 1,600 Hurricane Katrina and/or flood survivors from New Orleans, including approximately 300 children, arrived at Camp Gruber, an Oklahoma National Guard base in Eastern Oklahoma.

Problem: The primary function of Camp Gruber to train support personnel for the Oklahoma National Guard. This is not a child-safe environment. It was hypothesized that the camp contained numerous child injury hazards and that these hazards could be removed systematically using local child injury prevention experts, thereby preventing unintentional injuries to the displaced children.

Methods: On 08 September, “Operation Child-Safe” was launched by the Pediatric Injury Response Team to identify and remove pediatric injury hazards from Camp Gruber. Injury prevention experts from the Safe Kids Tulsa Area (SKTA) Chapter, the closest pediatric injury prevention group in the region, spearheaded the operation. Several visits were required to remove all of the injury hazards that were identified.

Results: Many hazards were identified and removed immediately, while others were addressed in a formal letter to the Camp Gruber Commander for required consent to implement changes. Hazards identified in the camp included, but were not limited to: (1) dangerous chemicals; (2) choking hazards; (3) open electrical outlets; and (4) missing smoke detectors. Bicycle helmets, car seats, strollers, portable cribs, and other safety-related items were passed out to families in need. A licensed daycare facility also was established in order to give the adult guardians a break from constant supervision. Over the course of one month, only one preventable injury (minor head injury) was reported during camp operations, and this particular injury occurred two days before “Operation Child-Safe” was initiated (Day 3 of camp operations).

Conclusions: In the aftermath of an event that displaces large numbers of people, it is likely that children will be exposed to numerous injury hazards. Volunteers with expertise in child injury prevention are needed to make an evacuee shelter safer for children.

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Introduction

On 29 August 2005, Hurricane Katrina made landfall primarily in the US coastal regions of Louisiana and Mississippi. Two days following the event, one section of the Lake Pontchartrain levy system was breached, resulting in the flooding of approximately 80% of New Orleans. Nearly three weeks later,

Date	29 August 2005
Hurricane	Katrina
Scope	US Gulf Coastal Regions
Magnitude	Category 5
Children still missing	2,000

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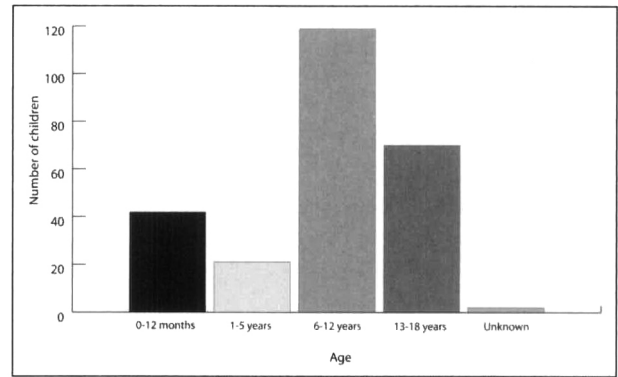
Table 1—Hurricane Katrina made landfall primarily in Louisiana and Mississippi. Two days later, one section of the Lake Pontchartrain levy system was breached leading to flooding throughout approximately 80% of the city. Three weeks later, approximately 2,000 children were listed as missing

approximately 2,000 children had been reported missing (Table 1).¹ Early in the morning of 04 September 2005, approximately 1,600 hurricane and/or flood survivors, including around 300 children, arrived from New Orleans at Camp Gruber, a 33,000-acre National Guard Joint Maneuver Training Center in Eastern Oklahoma.² These New Orleans residents came from the Superdome and nearby locations and were driven for 31 hours to Camp Gruber.

The medical care at Camp Gruber was provided through a partnership between the Oklahoma State Department of Health (OSDH) and the Oklahoma Medical Reserve Corps (MRC). The Oklahoma Pediatric Injury Response Team (PIRT) was established to coordinate and deliver a comprehensive program of medical services to the children at Camp Gruber. These services included: (1) emergent and chronic medical care; (2) child/guardian identification; (3) child abuse prevention and missing child-parent reunification (“Operation Child-ID”); (4) injury prevention and control measures (“Operation Child-Safe”); and (5) a licensed daycare facility.³ Many school-aged children were enrolled in the Muskogee School District.

Built in 1942, the primary function of Camp Gruber is training support personnel for large numbers of troops from the Oklahoma National Guard. This is not a child-safe environment. During the time that Camp Gruber was to serve as a shelter for Hurricane Katrina evacuee children, it was imperative that pediatric hazards in the shelter be identified and removed to help prevent unintentional injuries. It was essential to rapidly assemble a team of child-safety/injury prevention experts from the region that could devote the necessary time, energy, and resources to this end.

Upon arrival at the camp, many of the children were not registered with the American Red Cross. Therefore, their demographic information was not recorded. Shortly thereafter, a focused effort was made by the PIRT to register and obtain demographic information on each of the children (Figure 1). A total of 254 children (112 boys and 142 girls) <18 years of age were registered through this formal process. It was impossible to register every child in the camp and it is estimated that approximately 50 children



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Figure 1—Age distribution of 254 children registered at Camp Gruber by the Pediatric Injury Response Team. An estimated 50 children were not registered

either were unregistered or already had departed the camp to be reunited with family members or relocated to another shelter.

Children represent a vulnerable population and special considerations are necessary to properly care for them during disasters.^{4,5} Comprehensive disaster response includes addressing the unique needs of children during mass-casualty incidents.^{6–8} There is convincing evidence that the US is ill-prepared to handle disasters that involve large numbers of displaced or injured children.⁹ There have been no substantial studies investigating the incidence and prevention of injuries to children in the aftermath of an event resulting in a disaster, although inadvertent injuries to children have been reported in such events due to natural hazards.¹⁰ In times of displacement, disorder, widespread individual stress, and community recovery, the protection of children from injury becomes a major challenge and should become a priority for the healthcare community.

The mission of Safe Kids Worldwide, a global network of organizations, is to prevent unintentional injuries among children <14-years-old and younger. More than 450 Safe Kids coalitions in 16 countries bring together health and safety experts to educate and protect families with children. This valuable resource was the closest such resource in the region and is based in Tulsa, Oklahoma, approximately 60 miles from Camp Gruber.

The purpose of this study is to identify unintentional injury risks that children face when placed in a military-style, evacuee shelter after a complex human emergency and to describe an innovative, successful approach to child injury prevention that utilizes the expertise and materials provided by Safe Kids Tulsa Area (SKTA), a community resource already in place.

Methods

Institutional Review Board (IRB) approval for this work was granted by the Saint Francis Hospital IRB Chairman, and separately for review of late medical records, by the Oklahoma State Department of Health.

“Operation Child-Safe” was launched to identify those hazards at Camp Gruber that might lead to preventable child injuries and/or death. Key members of SKTA were brought in to formally inspect Camp Gruber for pediatric injury haz-

Specific Danger	Risk to Children	Intervention
Young children were playing in the second-story stairwell and fire escape areas, where the railing bars were spaced too far apart.	Falling from height and head entrapment	The Camp Commander was advised to place families with young children on the first floor of the barracks rather than the second floor, as the stairwells and fire escapes were hazardous to children. One pressure-closing child safety gate was installed in one stairwell where young children were observed to be playing. The mother of the children was taught how to use the gate and she was glad to have it. More safety gates were provided in the following days.
Open windows and torn screens were easily accessible to children.	No protection from a second-story fall	The Camp Commander was advised to place families with young children on the first floor of the barracks rather than the second floor because the open windows and the lack of screens were fall hazards.
Several walkers were found throughout the camp and three mothers had them on the second floor.	Falling down stairs	Moms with toddlers and babies were encouraged to use cribs, strollers, and play pens. All walkers were removed from the Distribution Center.
Large troughs and buckets with ice water and drinks were sitting outside the barracks where small children could access them.	Drowning	Large open troughs that supply drinks for the barracks were all removed on the first day of the operation. The Camp Commander was advised not to place them out anymore.
Many cleaning buckets full of water and some with cleaning solutions were sitting outside the dorm halls with mops in them.	Drowning; Poisoning	Open cleaning buckets were emptied and removed.
Hazardous chemicals were found within reach of children and often on the floors of barracks. Bleach and other cleaning agents were found on beds, floors, counters, and in the bathrooms. Toddlers were seen rolling one full bleach bottle on the floor to one another as if it were a toy.	Poisoning	Containers of chemicals were removed.
Small, hard food items were easily accessible in the recreation rooms where hard candy, peanuts, gum, small toys, and coins sat on the tables and floor areas. Some of the rubber toy balls were rolling on the floors.	Choking in young children	Several broken toys, cracked, pacifiers, and toys with missing and loose parts were discarded.

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Table 2—Numerous child injury hazards were identified at Camp Gruber, an Oklahoma evacuee shelter for New Orleans residents displaced by Hurricane Katrina. Injury control measures were implemented as noted. (continued)

ards that might exist and provide solutions to eliminate or modify these hazards. On the fifth day of camp operations, the individuals formally inspected each of the barracks in which child evacuees were housed. Subsequent visits also were made by this team of child safety experts to provide solutions to the identified hazards and to follow-up on the improvements that were instituted during the initial two visits. Notes were taken and saved for the purpose of documenting and tracking the injury prevention control measures implemented at Camp Gruber. By means of sending a formal letter to the Camp Gruber Commander, notice was given and recommendations made about numerous safety concerns.

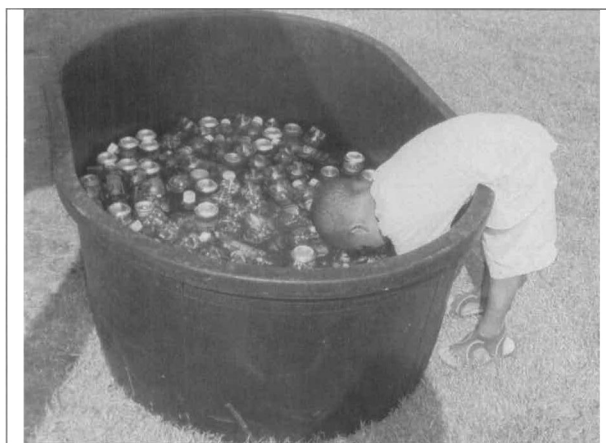
A daycare center also was opened for children ≤5 years of age. Four teachers from Muskogee Head Start supervised the children. One rationale for a daycare center was that the children would be better supervised in a controlled environment, in addition to providing the adults with opportunities for rest and time for counseling and evacuee assistance services.

All pediatric medical records were reviewed three and one-half months after the closing of Camp Gruber. Each pediatric medical record was reviewed for evidence of an unintentional injury having occurred at Camp Gruber. All ambulance run records from Camp Gruber also were reviewed for evidence of pediatric injuries.

Specific Danger	Risk to Children	Intervention
Small infants and toddlers were sleeping on cots with no padding on the concrete floors beneath them. (Some of the moms did not want cribs or port-a-cribs as they wanted the young children to sleep with them).	Fall hazard that could result in head injury; Suffocation or Sudden Infant Death Syndrome due to co-sleeping at a young age	Small children were in need of their own supervised, fenced, safe-play area. They also needed age-appropriate large toys and playground equipment. Foam mats were placed on the concrete floors below young children's beds in order to cushion a potential fall.
Some of the fire extinguishers were hanging from the walls, and no barriers were present. Several fire extinguishers were missing.	Inhalation or eye injury from extinguisher discharge; Fire and smoke inhalation if extinguishers are not maintained properly or are missing	An official Fire Department assessment was recommended.
Some sleeping areas were found not to have a smoke alarm.	Fire and smoke inhalation hazard	An official Fire Department assessment and installation of smoke alarms were both recommended. 3 were installed in the new Daycare Center.
Electrical outlets were eye level and exposed.	Electrocution hazard	>500 electric outlet covers were installed.
The kids were skateboarding and riding scooters and bikes in the halls and parking lots without helmets. No boundaries were marked as to where kids should ride safely. One toddler darted in front of the SKTA van as team members were leaving.	Auto-pedestrian injury	30 bike helmets were distributed to children; "Caution: Children Playing" signs were posted to warn drivers as they drove in and around the camp.
There were two basketball areas. Young kids were playing basketball with older teens and roughhousing was observed.	Danger of sports-related injuries; Danger of roughhousing injuries	Supervision of children playing basketball was recommended
Children were seen leaving Camp Gruber in private cars and church vans, etc., without car seats. The team went into the Red Cross Distribution Center to inspect the items donated for children. Two officially recalled (by the Consumer Product Safety Commission) car seats, a shield booster, a broken swing, and two walkers were found and immediately destroyed.	Motor vehicle collision injury	8 car seats were left at the Discharge Station with 2 Red Cross volunteers. They included Infant, Toddler and Booster seats; 3 car seats were left at the Medical Compound; 2 car seats were given directly to families who were leaving to travel cross-country. 1 Infant seat was given to a mother who had a small infant. More car seats were offered if needed. The Discharge Staff was preparing 4 families with children <8-years-old for relocation and 8 marked child restraints were left with them for transporting the children. Also, phone numbers were exchanged with Red Cross staff so they could obtain more seats if needed. Education was also provided to Discharge Staff about the Oklahoma law and what is safe travel for children <8 years of age.
Miscellaneous	Miscellaneous	Safe Kids Worldwide posters, stickers, brochures and coloring books were provided to volunteers at the Distribution Center to help convey information on product safety and pediatric dangers that might be associated with certain items.

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Table 2 (continued from page 361)—Numerous child injury hazards were identified at Camp Gruber, an Oklahoma evacuee shelter for New Orleans residents displaced by Hurricane Katrina. Injury control measures were implemented as noted (SKTA = Safe Kids Tulsa Area)



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Figure 2—An unsupervised two-year-old boy who was seen reaching into one of the ice water basins placed outside the army barracks for evacuees. These basins presented a drowning hazard to infants and young toddlers

Results

The members of SKTA identified numerous child hazards and many strategies immediately were put into effect (Table 2). Some interventions could not be implemented on the first day and in those situations, strategies were initiated or planned for subsequent visits. In some situations, injury control measures required approval or coordination by the Oklahoma National Guard; recommendations for these interventions were made immediately in a formal letter to the Camp Gruber Commander.

After the initial camp assessment was made and numerous hazards were identified, "Operation Child-Safe" volunteers began to implement the solutions. Some hazards were removed immediately from the reach of children. These removed hazards included: (1) large tubs of water behind the barracks (Figure 2); (2) mop buckets filled with water; and (3) cans of pine oil and bleach sitting on the floor of the barracks. Providing bicycle helmets, car seats, strollers, and portable cribs mitigated some hazards.

Maintenance needs, such as window screens and properly spaced stairway railings, were identified to help ensure the safety of children at Camp Gruber, and it was recognized that these presented logistical challenges on various levels. The "Safe Kids" team was available at all times for consultation and assistance. Each of the barracks and other camp buildings were re-visited to assess the status of previously identified hazards and prevention measures.

The Daycare Center was operational for 12 days and averaged 12 children/day. There were a total of 141 child-visits with a maximum of 20 visits per day and a minimum of three visits per day. During the initial Daycare Center assessments, several child injury hazards were identified (Table 3).

Review of Medical Clinic and Ambulance Records

From 04 September through 24 September 2005, medical care was provided to 123 children (in 146 visits) at the Camp Gruber clinic. The primary purpose of the medical clinic was to provide acute medical/trauma care and routine

preventive medicine to adults and children. Three children were treated at the medical clinic for unintentional injuries. Two of these children were sent to a nearby emergency department for radiographic studies, which were normal. Upon follow-up, each of these three patients was doing well and had recovered well from their injuries.

Case Reports

Patient 1 was a 17-year-old male who injured a thumb while playing basketball. He was taken to a nearby emergency department for suture repair of a laceration and x-ray to rule out a fracture. His injury occurred on the sixth day of camp operations.

Patient 2 was a 7-year-old male who also injured a finger playing basketball. He was seen in the medical clinic, diagnosed with a thumb abrasion, and discharged with minimal treatment. The data from his presentation was not recorded in his medical chart.

Patient 3 was a 9-year-old girl who fell from the top section of a bunk bed, sustaining a closed head injury, and scalp laceration. She did not sustain a concussion. Her injury occurred on the third day of camp operations.

Daycare Follow-Up

No injuries to children at the Daycare Center were reported.

Discussion

After Hurricane Katrina and the ensuing floods of New Orleans, thousands of children were displaced from their homes and housed in temporary shelters. At Camp Gruber, two general categories of child injury hazards were identified:

1. Pre-existing conditions, such as open electrical outlets, lack of smoke detectors, and insecure windows and screens; and
2. Hazards created as a result of the influx of evacuees, volunteers, and relief efforts, such as open water-containing basins, unsafe toys, and open containers of chemicals and cleaning materials. Interestingly, several baby walkers were found and destroyed. (Walker sales are banned from stores because they are known to cause children to roll down stairways.)

"Operation Child-Safe" was launched to prevent serious unintentional injuries or death to children while staying at Camp Gruber. While there is minimal objective control data against which to compare this study group, these pediatric injury prevention efforts seem to have been successful. Prior to this study, no research had been done on pediatric injury prevention during or following disasters. Fortunately, there have been very few pediatric mass-casualty, terrorist events from which to draw experience and first-hand knowledge in this area; but it is important to develop theories and models based upon what is known about pediatric disaster response to overcome shortcomings in disaster preparedness. Those models should include well-accepted principles of disaster management and the additional methods for caring for large numbers of children during disasters.

Daycare and School

An increased incidence of child abuse has been reported to occur during large-scale disasters.¹¹ One hypothesis assumes that this increased incidence of abuse is associated

Specific Danger	Risk to Children	Intervention
The Daycare Center needed puzzle carpet squares and strips of carpet that could be placed between beds in the barracks to cover the concrete floor.	Falling	Carpet strips and foam pads for play areas were laid over the floor in six places.
No smoke detectors	Burn/Smoke Inhalation	Smoke detectors were placed in both rooms of the Daycare Center.
The window blinds in the Daycare needed to be replaced as they had continuous loops that were creating a strangulation hazard.	Strangulation	The broken blinds were removed and replaced with "painted on" drapes on the windows. Artwork the children had made was taped on the windows to block sun.

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Table 3—Specific child hazards were also identified in the Daycare Center at Camp Gruber. Injury control measures were implemented as noted.

with the tremendous psychological stress placed upon the adults as a result of being displaced, out of work, and financially devastated. A recurring request from parents at Camp Gruber was for the implementation of a daycare center. Some of the parents had gone seven days without a break from supervising their children. The type of services provided by a daycare center is essential for basic needs of adults with children and it allows for time to begin the process of finding a home and financial assistance via available camp resources.

One primary goal of disaster response is the quickest possible return of the victims to normalcy. Providing children access to daycare or school as early as possible is one such way of providing a normal routine. Although school enrollment was not a component of "Operation Child-Safe", it helped to prevent unintentional injuries at Camp Gruber. Having kids spend their time in daycare or school not only returns them to a productive learning environment and gives them a sense of normalcy, it minimizes their time spent in a potentially hazardous environment, such as a military base like Camp Gruber.

Limitations

This project had no matched control group, and therefore, it cannot be stated that injuries were prevented. One anecdotal case should be noted—the only potentially serious, unintentional injury (a 9-year-old girl falling from a bunk bed) occurred three days prior to the initiation of "Operation Child-Safe." Fortunately, the patient did not suffer serious injury and recovered fully.

Further Research

Child injury prevention is an essential component of pediatric disaster response. However, studies to support the hypothesis that unintentional injuries increase among children during a disaster have yet to be conducted. The infrequent occurrence of disasters and the very nature of these crises make it difficult to design, plan, find, and conduct studies to mitigate pediatric injuries through implementation of injury control measures as a disaster response element. Nonetheless, it is important to conduct similar studies in the future with control groups and larger study populations. And, Safe Kids Worldwide chapters should be approached formally by community disaster planners to join preparedness efforts.

This project did not use a standardized tool for the identification of child injury hazards, but utilized the knowledge of safety experts who walked through all areas of Camp Gruber where children were likely to be living, eating, and/or playing. In the future, it would be most helpful to have a specific tool in the form of a checklist that itemizes all hazards likely to be present and appropriate mechanisms for their elimination or modification. When it is known that a specific location such as a military base or sports complex, is pre-designated to serve as an evacuee shelter, a child injury prevention plan should be in place. Such a plan should enable easy communication with child safety experts who rapidly can identify and eliminate or modify hazards.

Conclusions

During a disaster that displaces large numbers of people, it is likely that children will be exposed to numerous injury hazards. Personnel with expertise in child injury prevention are needed to make an evacuee shelter safer for children. Creating a child-safe shelter will be even more time-efficient and effective if experienced safety/injury prevention experts are involved in the setup of a camp before the first evacuees arrive. The Safe Kids Tulsa Area proved to be a valuable resource to Camp Gruber, a facility that was not intended to house children. In future disasters, Safe Kids Worldwide chapters, when available, should be included to provide pediatric injury prevention services, an essential component of pediatric relief efforts.

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References

1. CNN.com: Louisiana trying to find 500 foster children. Available at <http://edition.cnn.com/2005/US/09/16/katrina.missingchildren/index.html>. Accessed 21 September 2006.
2. GlobalSecurity.org: Camp Gruber Training Center. Accessed at <http://www.globalsecurity.org/military/facility/camp-gruber.htm>. Available at 21 September 2006.
3. Brandenburg MA, Heaps W: Instructions for Identifying and Protecting Displaced Children. Centers for Disease Control and Injury Prevention Health Alert Network. Available at <http://www.phppo.cdc.gov/HAN/ArchiveSys/ViewMsgV.asp?AlertNum=00236>. Accessed 06 February 2006.
4. Vogel JM, Vernberg EM: Children's psychological responses to disasters. *J Clin Child Psych* 1993;22(4):464–484.
5. Brandenburg MA: Pediatric Considerations in Disaster: In *Disaster Medicine* Hogan DE, Burstein JL Eds, Lippincott, Williams and Wilkins. Accepted for publication (2006).
6. American Academy of Pediatrics, Committee on Pediatric Emergency Medicine: The pediatrician's role in disaster preparedness. *Pediatrics* 1997;99(1):130–133.
7. Baker DR: A public health approach to the needs of children affected by terrorism. *J Am Med Womens Assoc* 2002;57(2):117–121.
8. Seaman J, Maguire S: ABC of conflict and disaster: The special needs of children and women. *BMJ* 2005(331):34–36.
9. Markenson D, Redlener I: Pediatric disaster terrorism preparedness national guidelines and recommendations: Findings of an evidence-based consensus process. *Biosecurity and Bioterrorism* 2004;2(4):301–314.
10. Quinn B, Baker R, Pratt J: Hurricane Andrew and a pediatric emergency department. *Ann Emerg Med* 1994;23:737–741.
11. Curtis T, Miller BC, Berry EH: Changes in reports and incidence of child abuse following natural disasters. *Child Abuse Negl* 2000;24(9):1151–1162