

Rehabilitation of Severely Injured Children

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Injury is the leading cause of death and disability in childhood. Ideal systems of care integrate comprehensive management of acutely injured children with rehabilitation. We review the nature of childhood injury, its disabling consequences, and the best ways to manage the care of children with serious injuries.

(Gans BM, DiScala C: Rehabilitation of severely injured children, *In Rehabilitation Medicine—Adding Life to Years* [Special Issue]. West J Med 1991 May; 154:566-568)

Acutely and severely injured children are frequently in need of rehabilitation services and programs. They may need a single service, such as specific exercises provided by a physical or occupational therapist, or diagnostic assistance by a physiatrist, such as an electrodiagnostic examination to determine prognosis in a nerve laceration, or they may need more extensive help, requiring a comprehensive multidisciplinary rehabilitation program.

Nature of Disabling Childhood Injuries

The full nature and scope of childhood injuries is becoming better understood through a major multi-institutional study called the National Pediatric Trauma Registry.¹ Centered at Tufts-New England Medical Center in Boston, Massachusetts, the registry collects information from 55 pediatric trauma centers in the United States and Canada. Funded by the National Institute on Disability and Rehabilitation Research, the registry has a unique focus on the functional status of surviving children discharged from acute care.² Phase I of the study, conducted from 1984 to 1988, contains the case records of almost 12,000 children. Phase II (in operation since the close of Phase I) contains an expanded information set about functional status and currently holds more than 10,000 records.

In the data set, nine specific domains of function are identified, including vision, hearing, speech, self-feeding, bathing, dressing, walking, cognition, and behavior.³ Each function is rated as to age-appropriate or disabled. In the Phase II data, estimates of the duration of the disability are also made by the discharging trauma center.

The combined data set of almost 23,000 records reveals a number of important demographic characteristics about childhood injury and the associated impairment, disability, and handicap. For the entire 23,000 cases, 66% are male. Approximately 97% of the children survived their injuries and were discharged from the trauma center.⁴ About 4% of the disabled children were transferred to inpatient rehabilitation programs.

Figures 1 through 8 show the data that resulted from this study.^{1,5} From these data, it is clear that childhood injury requires a variety of rehabilitation services and programs and that multisystem injuries, extremity injuries, and traumatic

head and neck injuries are the dominant diagnostic groups in need of services.

Comprehensive Care of Injured Children

The best system of care for an injured child includes early and effective rehabilitation services. A Level 1 pediatric trauma center will have a pediatric physiatrist available 24 hours a day to help initiate this care. In the earliest phases of management, an injured child's life may be in jeopardy. A rehabilitation team will be able to focus on less life-threatening aspects of care that will allow surgeons to better manage the primary injury. If the rehabilitation team institutes preventive care for contractures and skin breakdown, for example, many problems will be avoided.

In serious injuries, participation by the rehabilitation team in medical and surgical decision making will lead to the best outcome. In a patient with a crushed limb, for example, the rehabilitation perspective on the functional options for elective amputation can be important in determining the level of amputation. Similarly, in patients with spinal fractures, orthopedic surgeons, neurosurgeons, and physiatrists may jointly make decisions that allow the fastest recovery of mobility.

Early referral to a rehabilitation team will allow func-

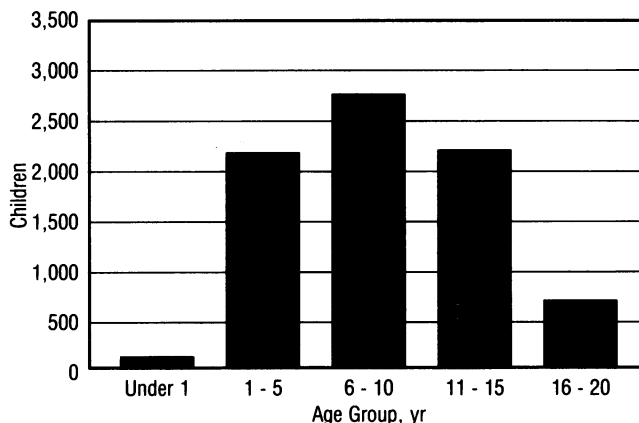


Figure 1.—Age distribution is shown of injured children with residual disability (from the National Pediatric Trauma Registry Phase I and Phase II data, 8,642 cases).

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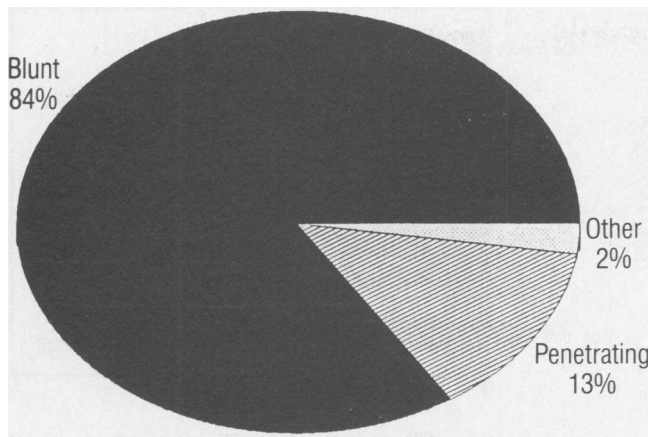


Figure 2.—The “pie” is divided into the type of injury experienced by children with residual disability (from the National Pediatric Trauma Registry Phase I and Phase II data, 8,642 cases). Blunt injury is the dominant type of injury experienced by this population.

tional considerations to be integrated into the acute care plan, responsibility for certain aspects of care to be delegated, and the various specialists in a patient’s care to participate fully in decision making so that priorities can be established for patient care and resource allocations.

Injured children who will benefit most from early rehabilitation referral include those with traumatic brain injury, spinal cord injury, multiple bone fractures, major neurologic injuries of the peripheral nervous system, and traumatic amputations. Children with paralysis, spasticity, loss of sensation, contractures, decubitus ulcers, and multifactorial impairments will likely benefit symptomatically from a timely referral.

The disabilities that should be addressed by a rehabilitation team include disruptions of communication, mobility, self-care skills, cognitive function, schooling, and the ability to play. A patient with any combination of dysfunctions should be strongly considered for referral.

Specific Rehabilitation Problems

Communication

For children with serious disruptions of communication abilities, such as those due to airway diversion or brain injury, providing alternative methods of communication should receive the highest priority, whether through the use of writ-

ing, signing, or lip reading. For those few children with residual motor or neurologic deficits, the use of augmentative communication systems and devices such as speech-generating computer systems may be necessary.

Mobility

Early in almost any serious injury, mobility will be limited. For those children who will not quickly return to walking, the use of a manual or powered wheelchair will be required. Many specialized wheelchairs now exist for children, including lightweight manual chairs and developmentally appropriate power wheelchair systems. Prescribing appropriate seating and positioning systems for the wheelchair and other environments will also be important for long-term rehabilitative management.

Self-care

The reestablishment of preinjury self-care skills is important. Temporary impairments, such as those requiring upper extremity casts, may make accommodating to dependence preferable to major therapeutic interventions. On the other hand, a severely impaired child will require long-term and developmentally gauged therapy services to learn either new methods or to use adaptive aids and devices to achieve independence.

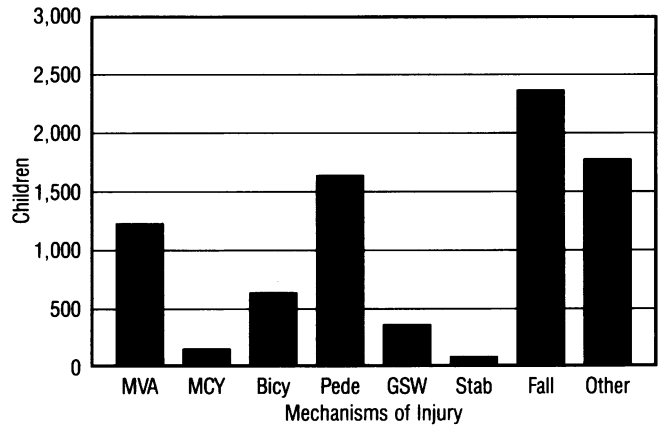


Figure 4.—The mechanisms of injury are shown for children with residual disability (from the National Pediatric Trauma Registry Phase I and Phase II data, 8,642 cases). Bicy = bicycle, Fall = fall from height, GSW = gunshot wound, MCY = motorcycle, MVA = motor vehicle accident, Pede = pedestrian-vehicle injury, Stab = stabbing. Vehicle-related injuries account for 44.7% of all cases.

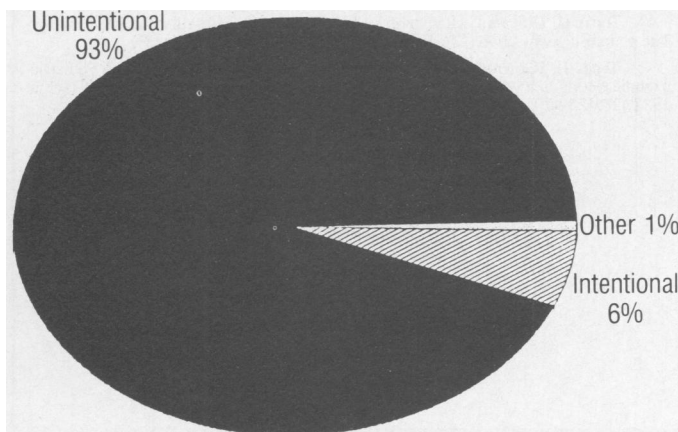


Figure 3.—The circumstances of injury experienced by children with residual disability are shown (from the National Pediatric Trauma Registry Phase I and Phase II data, 8,642 cases). Most children in this study are the victims of unintentional injury.

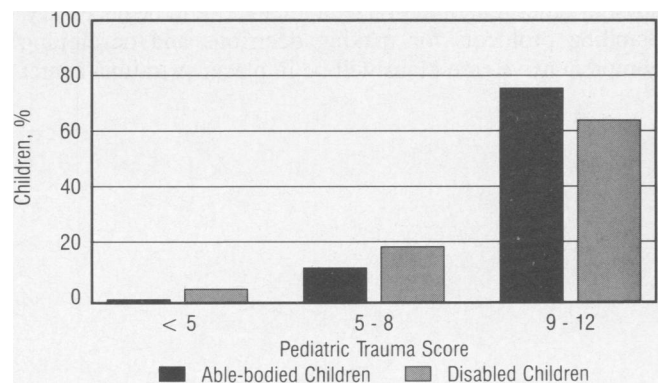


Figure 5.—A Pediatric Trauma Score (PTS) is recorded for injured children (from the National Pediatric Trauma Registry Phase I and Phase II data—12,263 able-bodied cases and 8,333 disabled cases—and Tepas et al⁵). The lower the score, the more life-threatening and severe the injury. Children with lower PTS ratings are more likely to have disability from their injuries.

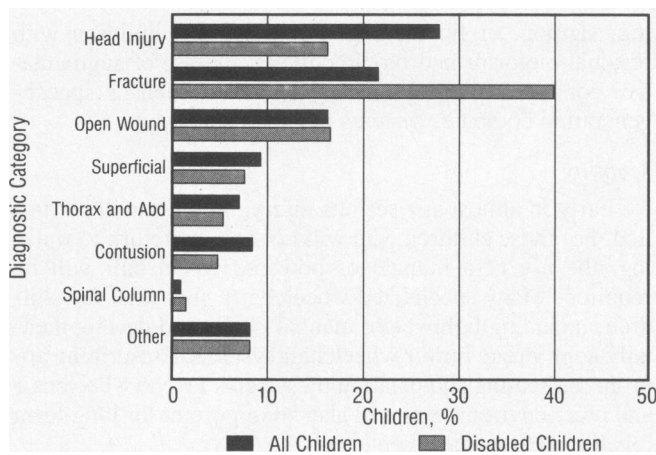


Figure 6.—The diagnostic category is shown for all injured children and those with residual disability (from the National Pediatric Trauma Registry Phase I and Phase II data; 22,508 total cases, 8,642 disabled cases). "Head Injury" includes skull fractures, concussions, and intracranial injuries; "Fracture" includes all noncranial fractures; "Open Wound" includes all lacerations and amputations; "Superficial" includes abrasions; "Thorax and Abd" includes all injuries to internal organs of the thorax and abdomen; "Contusion" includes superficial injuries with intact surface; "Spinal Column" includes all injuries to the spinal column, with or without neurologic involvement; "Other" includes strains, injuries to blood vessels or nerves, and the like.

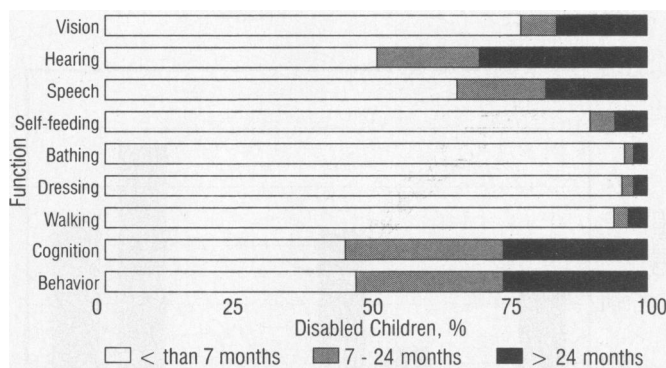


Figure 7.—The graph shows the duration of disability. The anticipated duration in 1 or more of the 9 categories of function is assessed by the trauma center at the time of discharge (from the National Pediatric Trauma Registry Phase II data only, 4,041 cases).

The Ideal System of Health Care

An ideal system of trauma care recognizes the desirability of early and effective integration of rehabilitation services into the acute care system. A screening evaluation by a physiatrist or other rehabilitation team member will be necessary. Standing protocols for making decisions and developing comprehensive care plans will be in place. A trauma center

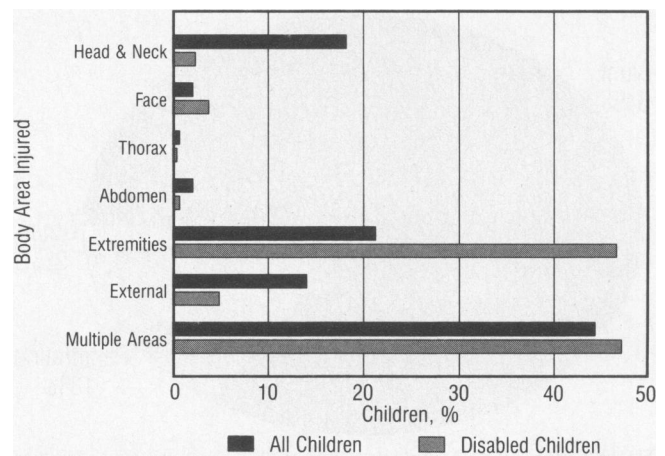


Figure 8.—The graph shows the injured body area (from the National Pediatric Trauma Registry Phase II data, 4,041 cases). Multilocation injuries, extremity injuries, and head, face, and neck injuries are more commonly associated with residual disability.

with a comprehensive rehabilitation program is likely to have a "seamless" interface between the acute and rehabilitative systems.³

As a patient-centered system of care, the ideal pediatric trauma system will be concerned not only about the survival of its patients but about their long-term ability to function. This will result in a program that monitors its performance and documents long-term follow-up with standardized data collection and periodic program reviews.

Conclusions

The rehabilitative care of injured children is an important aspect of any pediatric trauma system. Because almost all children who are admitted to a trauma center will survive, impairments and disabilities should be of the greatest concern. By prospectively incorporating a comprehensive rehabilitation program into an acute care system, resources will be used most effectively and the best results will be achieved.

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