

# THE INJURED CHILD

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SURGICAL MANAGEMENT

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# **THE INJURED CHILD**

## **SURGICAL MANAGEMENT**

*Edited by*

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## THE INJURED CHILD

# Preface

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AS WE WERE PLANNING the third edition of *Pediatric Surgery*,\* the editors became convinced that there was a need for a smaller work dealing exclusively with the seriously injured child, and we felt that the trauma section in *Pediatric Surgery* could form the nucleus of such a book. We have taken twelve chapters from this larger work, made extensive revisions in two more and added six new subjects. The result is an authoritative and up-to-date review of basic surgical principles in the care of injured children. It is our hope that this book will prove useful not only to general surgeons, pediatric surgeons and pediatricians but also to family physicians, surgical residents and emergency room physicians.

The nucleus of the book consists of comprehensive and skillful coverage of specific areas of childhood injury, such as the head, chest, abdomen and skeleton. To complement these chapters, well-known authorities have summarized current thinking on such essential topics as infection, shock, nutrition, life support, anesthesia, management of respiratory and renal failure, and the psychological and metabolic consequences of serious injury to children. As a result, the book provides a coherent and complete picture of current practice.

Comprehensive as it may be, this volume does not contain procedures to stem the growing epidemic of devastating childhood accidents. Ultimate solutions to this worldwide problem must be uncovered by epidemiologic studies. Such information should then lead an informed public to insist on protective legislation, with the aim of eliminating known hazards in the child's environment. All of us who stand in the doorways of emergency rooms receiving maimed children must focus on this larger objective of trauma prevention, as well as on the healing of wounds.

JUDSON G. RANDOLPH, M.D.  
for the Editors

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# 1 / Children as Accident Victims

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JUDSON RANDOLPH

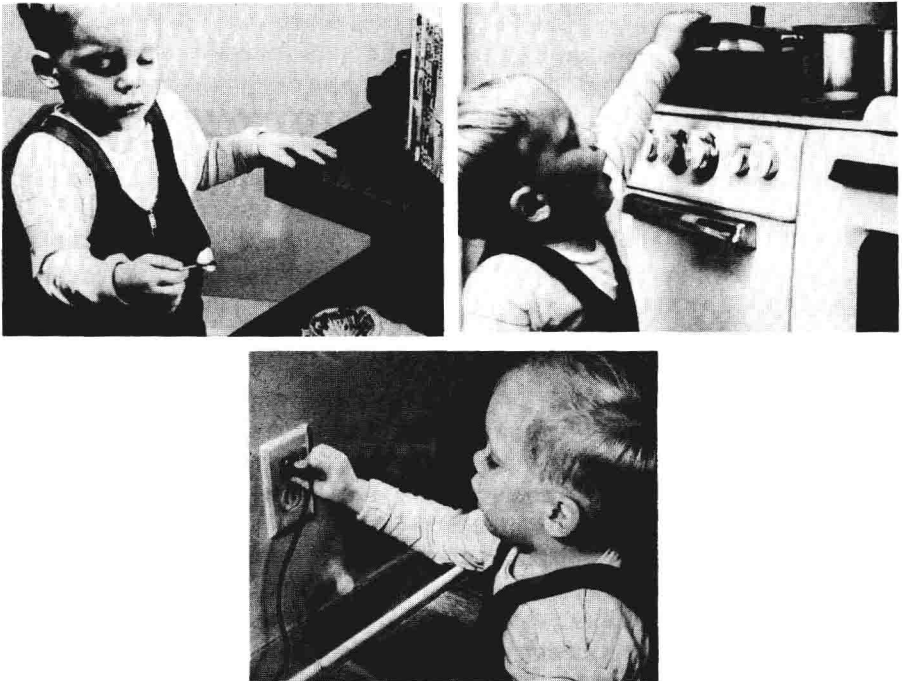
THE MOST recently published U.S. statistics<sup>7</sup> disclose that 26,826 children died who were from 1 to 14 years of age. Of this number, 12,448 were victims of accidents. By far the leading offender in these accidental deaths was the automobile, accounting for 5,796 dead children. Two thousand four hundred forty drowned, 1,218 died of burns, 533 were injured fatally by firearms and 214 died after ingesting various poisons. When the nearly 12,500 children lost by accident are compared to the 2,961 deaths in children from cancer, the magnitude of accidental death in childhood comes clearly into focus. Although infants under a year of age are less vulnerable to accidents, 1,691 of approximately 5,500 deaths in this age group were caused, in order of frequency, by poisoning, suffocation and automobile collisions. If an infectious disease caused such death and destruction among our children, the public outcry would demand protection and treatment. It is ironic that preventive measures that could alter these statistics go unheeded.

These stark facts demonstrate the urgency of reducing accidental injury to children. The surgeon's traditional role, the immediate care of accident victims, is well defined. Great gains have been realized in understanding the nature of bodily injury and its metabolic consequences. Technologic advances in life support systems and monitoring devices have produced steady improvement in the surgical salvage of injured children. Yet, the surgeon charged with caring for injured children may have an even more important role to play. Familiar as they are with the mechanisms as well as the consequences of trauma, surgeons have an obligation to the cause of accident prevention. Much can be done to eliminate existing hazards in the child's milieu. This is best accomplished by modifying the environment of the child and by improving the education of all citizens with respect to safety practices.

A major portion of childhood accidents occur in the home. It is of the utmost importance, therefore, to teach adults about the avoidable causes of injuries. Children cannot be left alone, or in the care of other children. Young mothers must learn how to "childproof" the home.

Matches must be kept hidden (Fig 1-1). The busy, young, inexperienced mother must be taught how to handle boiling water, gas ovens and fireplaces with safety and common sense. The pot handles on the stove and the coffee pot on the breakfast table must be placed out of the toddler's reach (Fig 1-2). Hot water heaters must be carefully regulated. Caustic materials cannot be placed in floor cabinets where toddlers can reach them. Electrical appliances must be built, maintained, used and stored according to predefined standards (Fig 1-3).

Legislation, heightened public awareness and nationwide acceptance of family safety practices are essential if the annual toll of injured children is to be reduced by a major increment. Excellent examples of favorable modification of the child's environment against



**Fig 1-1 (top left).**—Child with a lighted match. The fascination of fire and matches for the 5- or 6-year-old child is universal. All matches in the home must be kept sequestered from children.

**Fig 1-2 (top right).**—The vulnerability of 2-, 3- and 4-year-old children to boiling liquids on the stove.

**Fig 1-3 (below).**—Electrical plugs, wires and appliances are dangers inviting curious exploration by an unwatched child. (Photographs courtesy of Dr. A. M. Margileth.)

health threats are to be found in the control of lead poisoning and in the Flammable Clothing Act. Once it became obvious that peeling lead-based paint was being eaten by children, particularly in ghetto-urban settings, laws were enacted that eliminated the use of lead-based paint. This progressive action has materially reduced a major threat to children. The Flammable Clothing Act has had widespread importance for youngsters, and, as its effect spreads, greater protection will be realized, although the recent discovery of the carcinogenic nature of the flame retardant indicates the complexity of the problem.

Protection for children riding in automobiles has long been neglected. Shelness and Charles,<sup>4</sup> writing about children as passengers in automobiles, state that "it is ironic that a nation that ranks the welfare of children as priority is in the process of mandating the use of seat belts for parents, but does not insist on the same right for children." More small children are killed inside motor vehicles than outside.<sup>3</sup> For example, a review of automobile accidents and seat belt usage in 1970 disclosed that only 2,880 (15%) of 19,061 children under 5 years of age in collisions were restrained. None of those restrained were killed but 82 of the 16,181 unrestrained children lost their lives. The committee on Accident Prevention of the American Academy of Pediatrics has stressed the need for special restraint systems for young children who do not fit in the customary lap and shoulder straps. Tennessee is the first state to enact legislation requiring that young children be restrained while riding in automobiles. Known as the Child Passenger Protection Act, this law requires all children under 4 to wear federally approved restraint systems while riding in an automobile.

The immediate care of the injured child has improved dramatically in the past decade. Study of the metabolic consequences of trauma in the child has led to important gains in treatment of injured youngsters. Progress in the transportation of the injured victim has been noteworthy. With regionalization of pediatric trauma facilities, the concept of rapid transportation of the injured victim to the nearest hospital has, in forward-thinking communities, given rise to a network of metropolitan and rural transportation programs that interact with designated primary, secondary and tertiary trauma treatment centers. The effectiveness of transportation networks has been augmented in many instances by radio and television communication systems. Proper triage of the injured victims ensures expeditious transfer of those children with severe or multiple injuries to tertiary centers.

Under ideal circumstances, basic life support for any accident victim should be initiated at the scene. Bystanders will be helpful only if

they are prepared. Courses in basic cardiopulmonary resuscitation and emergency care might well be part of the curriculum for high school students. Such study should be mandatory for teachers, police, firemen and athletic coaches. Cardiopulmonary resuscitation courses such as those offered by the American Heart Association should be required of all persons providing immediate care for critically ill children. Traumatologists have pointed out many facets of care planning that could be implemented nationwide. Some of these elements are: (a) the universal establishment of the emergency 911 telephone service; (b) the creation of interconnected regional communications systems and emergency medical services operations centers (EMSOC); (c) the upgrading of all land and air ambulances to sophisticated, mobile intensive care units (MICU); (d) the upgrading of all ambulance attendants to emergency medical technicians (EMT) so that they can render advanced life support at the scene of the accident and during transportation; (e) the absolute control and continued monitoring of these emergency "beachheads" (EMT-MICU) by physicians and surgeons well versed in emergency care; and (f), most important, the regionalization and categorization of hospital emergency facilities for the care of children.<sup>2</sup>

When an injured child arrives in a hospital emergency facility, a trauma team should be on hand. Such a team may be headed by a surgeon and should include pediatricians, emergency nurses, an orthopedist, a neurosurgeon and a urologist. Resuscitation, stabilization, diagnosis and treatment should merge together smoothly.

It is especially important in children that critical assistance be rendered in a calm, compassionate and reassuring manner. Indeed, the entire process of transportation, diagnosis in an emergency facility, treatment, hospitalization and recovery demands strong support of the psyche of any injured patient, and this need is magnified in younger subjects. Psychiatrists and their co-workers have become indispensable members of the pediatric trauma team.

All adults have a responsibility to modify the environment on behalf of children and thereby minimize the potential for accidents. When accidents occur in the home, on the playground or in the street, bystanders should have enough training that they can function as emergency personnel because of their preparedness through public education. The transport system should incorporate accurate appraisal and prompt triage to an emergency unit or a regional care center. Once in the system, the child should move smoothly and swiftly from appropriate emergency care to an operating suite or to a pediatric intensive care unit. Throughout this course, the child's psychological needs



should be considered and supported. Only when the foregoing elements have been provided can we begin to control accidents and their consequences, which remain the number one threat to the health and life of all children.

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