RECENT TRENDS IN ACCIDENT PREVENTION

By George W. Starbuck, M.D.

Chairman, Committee on Accident Prevention, American Academy of Pediatrics

ALTHOUGH pediatricians have always been concerned, as individuals, with the problem of child safety, the intense interest of the American Academy of Pediatrics in accident prevention dates back only to 1950. At that time, the spectacular conquest of the common childhood diseases during the previous three decades had forced a remarkable drop in the mortality rate from disease, whereas, in sharp contrast, the decrease in the accident death rate had remained alarmingly slow—in fact, almost static (Figs. 1 and 2). This has focused attention and renewed emphasis on the still formidable problem of accidents, aptly described by Dietrich as childhood's greatest killer. Then, as now, accidents were the leading cause of death among children 1 to 14 years of age, accounting for fully one-third of all deaths at the elementary-school ages, and causing untold crippling, suffering and disability (Table I).

NEW NATIONAL COMMITTEE SETS ITS OBJECTIVES

When these facts were demonstrated to the Executive Board of the American Academy of Pediatrics, it established for the first time, in 1950, a Committee on Accident Prevention with Dr. George M. Wheatley serving ably as chairman.

The Committee adopted three broad approaches in its attack on accidents of childhood: education, engineering, and legislation. Physicians caring for children were to be alerted to the magnitude of the accident problem and encouraged to educate parents by pointing out specific hazards and initiating safety training of children. The Committee was to work with strategic groups, such as the American Standards Association, toward developing manufacturing standards for minimizing accidents involving such products as children's toys, clothing and furniture. Lastly, regulation and law enforcement were to be forwarded by studying, recommending, and securing passage of legislation designed to support sound preventive measures.

PRELIMINARY ACTION

The first action of the Committee was to determine the degree of interest and activity in child safety among Academy members. A questionnaire was circulated among the members inquiring whether they would be willing to join in the prevention program, and a positive reply was received from 70%.

A survey was then instituted among the members of the Academy to obtain information on the frequency of burns, strangulation, suffocation and poisonings encountered in pediatric practice. Analysis of the replies revealed that accidental poisonings accounted for 50% of all accidents reported, and burns 30%. The findings further indicated two important needs: To establish safety standards for the flammability of certain fabrics responsible for so-called "torch" deaths among children; and to prevent deaths from poisoning by lead in paint used on children's toys, furniture and other articles.

At the request of the Academy, representatives of the Lead Industries Association, Bureau of Standards, American Petroleum Institute, National Safety Council, and other organizations formed a Committee, under American Standards Association sponsorship, to consider the elimination of specific hazards to children through the enforcement of specific safety standards. Dr. Wheatley was appointed chairman of the Committee, known as Z66. Thus far this
committee Z66 has been successful in establishing the amount of lead in paint that would reduce the risk of plumbism from ingestion to a minimum. As for the so-called "torch sweater" type of burns, a commercial standard for the flammability of wearing apparel was developed, and in 1953 Public Law No. 88 was enacted by Congress. It prohibited interstate commerce in wearing apparel classified as "dangerously flammable" when tested by the prescribed method.\(^5\)

**ATTACK ON ACCIDENTAL POISONINGS**

The Academy's attack on accidental poisonings was, in the author's opinion, the most significant forward step up to this time. Poisonings cause nearly 5% of all fatal accidents among children in the 1 to 4 year age group, ranking fourth as a cause of
TABLE I
LEADING CAUSES OF ALL DEATHS
(By Age, United States—1954*)

<table>
<thead>
<tr>
<th>Age (yr)</th>
<th>Causes of Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>Accidents</td>
</tr>
<tr>
<td>5-14</td>
<td>Accidents</td>
</tr>
<tr>
<td>15-24</td>
<td>Accidents</td>
</tr>
<tr>
<td>25-44</td>
<td>Heart disease</td>
</tr>
<tr>
<td>45-64</td>
<td>Heart disease</td>
</tr>
<tr>
<td>65 and over</td>
<td>Heart disease</td>
</tr>
</tbody>
</table>


accidental deaths in 1954 (Table II). The preliminary survey had revealed a desire of the Academy members for assistance. This need, added to the frequency of poisoning by an increasingly wide variety of new substances, indicated that the practicing physician could be best aided by information identifying substances in accidentally ingested products and by suggested methods of treatment.3 To this end a Subcommittee on Accidental Poisoning was established in 1954, with Dr. Edward Press as its first chairman.

Dr. Press pioneered the work in this field with development of the Chicago Poison Control Center, opened in September 1953, for treatment, prevention and research, and by compilation of the manual, Accidental Poisoning in Childhood.5 This manual lists poisonous components of drugs, antidotes and other forms of treatment. Establishment of similar centers rapidly followed in Boston, Washington, Cincinnati, and other major cities.

In 1954 the United States Food and Drug Administration called a conference attended by representatives of the leading manufacturers of salicylates, toxicologists and pediatricians, at which specific recommendations for reducing accidental poisoning of children were adopted.6 These included specifications for labeling and packaging and urged that the strength of aspirin tablets for children be limited to 1/4 grains.

During the early efforts of the Committee on Accident Prevention, considerable educational activity was aimed at sensitizing physicians to the child accident problem and suggesting methods of solution. State accident committees were formed, and information was disseminated through personal correspondence, lectures, medical journals and meetings, round table discussions, exhibits, pamphlets and other materials.

Individual pediatricians throughout the country gave tremendous assistance to the program, to mention but a few: Dietrich, of California, contributed nationally through his extensive publications and influence on other physicians; Kotte, of Ohio, organized the first statewide conference on child accident prevention for health and welfare agencies and played an active role.
locally through his chairmanship of an action group organized to campaign for home safety; and Press, of Illinois, developed the Chicago Poison Control Center which provided the incentive and stimulus for the establishment of others throughout this country and Canada. The groundwork and pioneering accomplished in the first 5 years was little short of phenomenal, and is in great part responsible for the achievements in accident prevention today. For a significant contribution to pediatrics, we owe a considerable debt of recognition to Dr. George Wheatley and those who helped him initiate the Academy’s child safety movement.
NEW IMPETUS TO LOCAL AND STATE PROGRAMS

In accordance with Academy policy which limited the tenure of committee chairmen to 5 years, the author succeeded to the Chairmanship of the Committee in 1955. It was hoped that a practicing pediatrician might be able to inject new ideas into its program—proving an additional stimulus to physicians by further developing the basic, fundamental ideas that had been slowly, steadily and firmly implanted previously. In the same year the distribution of educational material and information was centralized at the Central Office of the Academy in Evanston, Illinois, where a steadily increasing number of inquiries for films, pamphlets and other materials were being received from members. Listings of visual aids, publications and other useful information were compiled and printed. Even more important, the Committee sought to stimulate the organization of new state and local committees, in order to give impetus to accident prevention at the "grass-roots" level. There, it was felt, it would have the deepest impact on the child accident problem.

ESSENTIALS FOR PREVENTION

There is no single solution to the problem of preventing accidents. Realistically, such solutions must do one of two things: They must either eliminate specific hazards in the environment; or alter child behavior through safety education. Any successful attack must be directed toward the child, within his immediate surroundings. The factors involved in each type of injury are multiple, and preventive efforts must be aimed at controlling all the factors in each situation.

With these essentials in mind, our Committee, during the past 2 years, has directed intense effort toward stimulating organized preventive activities at both state and local levels. As of July 31, 1957, there were 37 accident prevention committees in the United States and 4 in Canada—an increase of 6 over the previous year. The response to requests for annual reports from these committees was heartwarming and revealed a mushrooming of local preventive activities; by July 31, 1957, 29 such reports had been received. In comparison, by the same date in 1956 we had received only 14 reports from 35 committees.

STATE POISON CONTROL ACTIVITIES INCREASE

From the information obtained in the reports of the chairmen of the state accident prevention committees it is obvious that the growth of activity at this level is striking; a few examples of the work done may be interesting.

Florida was the first state to set up a network of poison control centers, 16 in fact, which have been functioning for the last year or two. An exhibit demonstrating the organization, function and distribution of the centers has been shown at various national medical meetings, including the Academy meeting in New York in the fall of 1956. The problem of kerosene poisoning has also been of major importance; Caithers and Grayson have been working painstakingly on it.

The Accident Prevention Committee of the Southern California section is currently interested in developing poison information centers throughout its territory. This work is being financed by the Southern California Chapter of the Academy and by an anonymous donor who gave $15,000 to establish a poison information center in Los Angeles. In the Northern California section, the Bay Area Poison Control Program has been organized, with 12 hospitals participating. Support is being received from the County Medical Society.

OTHER STATES TAKE ACTION

In Connecticut accident prevention activities have centered around poisoning. Following unsuccessful attempts to obtain passage of a warning-label law, a statewide survey was undertaken, and information
regarding the frequency and severity of accidental poisoning was presented to the committee reactivating this bill. As a result, its passage was recommended and it became law in May 1957. A second bill was passed appropriating $38,000 for establishment of a poison-control system. The success of these two accomplishments resulted entirely from the dogged efforts of our men in Connecticut, who overcame all obstacles and forced a tremendous step forward in their state's control of accidental poisoning.

In Vermont, professional education on the accidental ingestion of kerosene by young children has taken the form of exhibits and publications. The bulk of the effort in Arizona is devoted to poison control, with centers in Phoenix and Tucson. It is planned to extend this program to involve all "sizable" hospitals and to furnish them with files on poisons which they have accumulated in the form of a card index.

In Illinois, the pioneer Chicago program is being reorganized to set up facilities in several hospitals strategically and geographically located so as to serve the maximum number of physicians as easily as possible. The poison-control officer in each hospital is a physician.

Kansas has three control centers, in Manhattan, Topeka and Wichita, and the State Board of Health has distributed the Academy's manual to most of the hospitals in the state.

In conclusion, following the opening of the nation's first poison-control center in Chicago, a rapid succession of new centers were established, so that at the present writing 80 centers exist in various stages of organization throughout the country.

Press's Guide to the Organization of a Poison Control Center, which received excellent distribution, has had an influence in the development of local centers.

The Subcommittee on Accidental Poisoning, under the capable chairmanship of Dr. Press, deserves tremendous credit for its success in aiding in the development of poison-control centers throughout the country by way of lectures, public releases and consultation visits on a local and national scale.

THE NATIONAL CLEARING HOUSE

Early in 1957 the National Clearing House for Poison Control Centers began operation under the Accident Prevention Program of the Public Health Service. The clearing house was established through the joint efforts of the Subcommittee on Accidental Poisoning, the American Public Health Association's Subcommittee on Chemical Poisons, and other agencies. Local centers may look to the National Clearing House for:

(a) Information relative to new or improved methods of prevention and treatment of poison cases.
(b) An interchange of information with local poison control centers.
(c) Aid in establishing poison control centers and improving existing facilities.
(d) Studies of national and area trends in poisoning and of successful methods of prevention and treatment.
(e) Stimulation of development of new or improved methods of prevention and treatment of poisoning, and encouragement of research, both basic and clinical.
(f) Preparation of news releases for professional and lay health education.

The Clearing House plans to issue bulletins to poison-control centers at regular intervals and to send them information about new products on file cards.

WHAT OF ACCIDENTS OTHER THAN POISONING?

What about drownings, injuries caused by bicycles and motor vehicles, falls, mechanical suffocation, and burns? What is being done to diminish the toll of deaths from causes such as these, which comprise a major portion of all fatal accidents in childhood? What preventive activities, other than control of accidental poisoning, have Academy committees embarked upon? What other activities have they initiated,
or as interested groups, actively co-operated in?

Here again our State Committee Chairmen report a wide range of activity. In New Jersey, the State Chapter co-sponsored with the New Jersey Congress of Parents and Teachers, the New Jersey Department of Health and the New Jersey Safety Council an intensive statewide Home Safety Project for Young Children involving a questionnaire interview to determine attitudes toward safety among some 30,000 mothers. This project earned a safety merit award by the National Safety Council. An exhibit on home-accident prevention, displayed at the Spring Meeting of the Academy in Washington, at the American Public Health Association meeting at Atlantic City, and at meetings of the Medical Society of New Jersey, was awarded a certificate of merit at the American Public Health Association meeting and two state meetings.

The Long Island Section of District II of the Academy is organizing for action on a county basis. In Nassau County, the chairman has contacted 15 of the 33 pediatricians who are to be local chairmen of their communities, offering suggestions for organizing programs. County chairmen are being sought in Kings and Queens Counties who will initiate similar programs in these areas.

In Pennsylvania, the Child Health Committee of the Dauphin County Medical Society is proceeding on a sound basis by collecting statistics on accidentally injured children treated in hospital emergency dispensaries. These figures are published weekly, in expectation that the constant publicity will help engender local interest in organizing specific preventive programs.

The Massachusetts Chapter has been actively stimulating development of accident-prevention programs in local communities. Greater New Bedford, operating under a grant of $28,000 from the Charles H. Hood Dairy Foundation, supplemented by funds from the Massachusetts Department of Public Health, is engaged in a child safety program. This includes the reporting and analysis of accidents and control activities aimed at selected target areas such as drownings, bicycle injuries, accidental poisonings, etc. A second children's accident prevention program is being undertaken by the Nashoba Associated Boards of Health, representing a total of 16 rural towns, with a grant of $25,900 by the same foundation. The large metropolitan areas of Springfield and Worcester also are proceeding with programs.

In North Carolina, Academy members give talks on accident prevention throughout the state. The South Carolina Chapter is co-operating with the State Board of Health, the activities of which include the gathering of accident statistics, state-wide conferences on accident prevention, and the distribution of an accident-prevention pamphlet. An exhibit featuring home accidents and their prevention was set up at the state medical meeting in May, and local medical groups are being encouraged to sponsor at least one meeting a year on accident prevention. In Tennessee, a number of safety poster contests have been held in conjunction with the Tennessee Congress of Parents and Teachers, with bicycles awarded to winners. Twelve of fifteen school districts participated, representing 30 school systems.

In Denver, members of the Safety Committee of the Denver Medical Society participated in a survey of accidental injuries in a selected sample of the population which yielded excellent information on where accident prevention efforts are needed.

In California (Northern Section), a $1,800 safety exhibit financed by outside support has been developed for showing at county fairs and other public gatherings.

Summing up, it would appear that our pediatricians, either as individuals or as members of organizations, are in the vanguard of the current national movement to reduce the high accident mortality rate among children.
STANDARDIZATION OF EMERGENCY TREATMENT OF CERTAIN CONDITIONS

Although not preventive in a strict sense, the drafting of recommended treatment in certain emergency conditions, to forestall further injury or complications due to improper handling, has been one of the responsibilities assumed by the national Committee. In October, 1955, the Surgical Section's representative, Dr. C. Everett Koop, began a protocol defining the Emergency Care of Childhood Skeletal Trauma and the Emergency Care of Burns. Distribution began late in 1956 after final approval was given by the American College of Surgeons, the Civil Defense Administration, and our own Executive Board. To date, 5,500 copies have been distributed to police and fire departments, civil defense authorities, etc. The New England Camping Association alone requested 1,000 copies for distribution to member camps.

Currently the national Committee is working on recommendations for emergency treatment of other types of accidental injuries. Dr. Edward Wakeman is to determine, by questionnaire, the 10 most common injuries encountered in pediatric practice. Recommendations for the emergency treatment of these will be undertaken in a manner similar to the emergency care of burns and skeletal trauma.

The intense controversy as to whether children who have ingested kerosene and related petroleum distillates should be lavaged or not may be resolved with finality upon completion of a project currently sponsored by the Academy in co-operation with the American Medical Association and the American Public Health Association.

WHERE ARE WE GOING?

This month marks the seventh year of the Academy's efforts in the unchartered area of accident prevention. Looking back, in retrospect, we can say with a justifiable sense of achievement, we have made progress. To mention but few of the major advances stimulated by the Academy's efforts:

1. Official recognition of the severity of the problem evidenced by creation of the Committee on Accident Prevention with responsibility for reducing childhood accidents.
2. Direction of efforts toward elimination of hazards to children through establishment and enforcement of specific standards by the American Standards Association.
3. Sparking the organization of state accident prevention committees to stimulate state, local and individual accident-prevention activities within their areas.
5. Initiating the Poison Control Center movement and assisting in the development of individual centers.

The question confronting us now is: What are our future objectives? A look at the past, so to speak, holds a key to the future. Analysis of the annual reports from 37 state chairmen indicates that of the widely diverse preventive activities, accidental poisoning has been worked on more diligently by our Accident Prevention Committees than any other type of accident. In fact, the reports reveal that we are expending 73% of our total effort on this problem (Figs. 3 and 4). However, we must not lose sight of the fact that accidental poisonings cause less than 2% of all accidental deaths among children 1 to 14 years of age and little more than 4% of all fatal and nonfatal accidents in children 16 years of age and under (Fig. 5).

In terms of the total problem confronting us, what does this mean? Accidents continue to remain the most frequent cause of death among children in the United States—killing more than 14,000 youngsters 14 years of age and under each year. Of this total number, motor vehicles cause more than 29% of all accidental deaths among children 1 to 14 years of age and less than 2% of all accidental deaths among children 1 to 14 years of age and under (Fig. 5).

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A total of 17 (more than 61%) of our reporting State Accident Prevention Committees are devoting 100% of their time to poison control exclusively.
injury or inhalation of food or other objects, 9% (Fig. 6).

What are the implications of these facts for future planning and programming of the Academy? We should not abandon our fledgling efforts in accidental poisoning control. These represent, perhaps, our most significant forward step in a systematic, widely-based approach to a specific accident problem in this new area of accident prevention. We have now become familiar with a pattern of organization which can be modified according to need, and redirected at other types of major accidents. For the first time we have the background and knowledge not only to maintain our poison control activities effectively but, what is more important, to extend a concerted attack to other causes of injury such as these major ones already mentioned. Would not more intensive efforts directed at the causes of the overwhelming majority of deaths in children be more productive—not only in terms of energy expended—but in terms of lives saved?

PARENT EDUCATION

The physician, particularly the pediatrician, has a tremendous responsibility in the routine provision of medical advice to alert parents on the specific accident hazards which threaten the child at various stages of growth and development. More time should be utilized during routine examinations for counselling parents on safety attitudes, practices and behavior. Child safety
Fig. 4. Accident prevention activities of state chapters (American Academy of Pediatrics).

Fig. 5. How children (ages 0-16 years) get hurt.
MOTOR VEHICLES
burns and conflagrations
14.7%
drowning
12.9%
choking *
(by food or other objects)
8.6%
mechanical suffocation *
(by bed and credits)
7.8%
falls
4.5%
firearms
3.6%
poisoning *
(by solids or liquids)
2%
others
16.6%

*All reported deaths occurred in 0-4 age group only

Fig. 6. Types of accidental deaths for children ages 0-14, United States, 1954.

suggestions geared to specific age groups and other excellent material for parents and children are being made available by interested agencies (see Appendix). It is our responsibility to convert new findings from safety research into readily utilisable information for parents.

Dietrich has expressed interest in undertaking a survey of the teaching of accident prevention in medical schools of the United States and Canada.28 We sincerely hope this survey will be the first step toward educating every young medical graduate about accident causation and prevention.

MEDICAL LEADERSHIP REQUIRED

An acceleration in the trend toward the development of community-wide programs may be anticipated, involving mobilization of all of the community forces: physicians, nurses, educators, parents, police, statisticians, service clubs, official and voluntary agencies, and the like. The development of local programs must necessarily be inspired and sustained by medical leadership. How fine it would be for the Academy if programs of such importance could develop under the guidance and help of each of our state committees!

DETAILS SURVEY'S REQUIRED

A detailed survey of the problem of accidents will yield the most authentic basis for operations. A specific analysis of the type, frequency, cause and severity of child accidents—as well as age, sex, seasonal and regional factors—is mandatory if an intelligent attack is to be organized and priority of need, urgency and importance established. Excellent studies of this type are being carried on in New York City; Denver, Colorado; Cambridge and New Bedford, Massachusetts, to mention but a few.

CONSTANT EVALUATION NEEDED

A constant evaluation of experiences, policies and procedures will assure better results. To cite an example: Although the Poison Control Program is still young, our brief experience with it already suggests improvements which constant evaluation may reveal. Would a small stipend paid to reporting interns and house officers stimulate more complete, thorough coverage of poisoning and other accidents? Should we consider the advisability of requiring medical training of those who head poison-control centers and accept responsibility for
giving out information? There are indications that this might be desirable, but critical evaluation of present programs over an extended period with a view toward effecting improvements would provide the best answer.

RESEARCH NEEDED

The further we plunge into the field of accident prevention, the more acute becomes our awareness of the gaps in our knowledge which prevent greater progress. Do we know all we need to know about preventing accidents in children? What about personality and growth patterns of accident repeaters? What about proneness? How can we motivate behavior on the part of parents so that it will lead to a reduction in accidents? Clearly, much research is needed in these areas, but can we wait for the scientific findings of carefully controlled studies to be handed down to us? Or do we have responsibility for stimulating and co-operating in needed research programs? Within the limited confines of our own medical practice, can we contribute by carefully observing, among accidents which are brought to our attention, underlying threads of significance which can supply the missing fragments of the accident picture?

CLOSER RELATIONSHIP WITH STATE COMMITTEES

Local and state programs have been given considerable impetus by the dedicated efforts of many individual pediatricians throughout the country, as well as through questionnaires, correspondence, and other channels of communication with the state accident prevention committees. We foresee a systematic and periodic stimulation at local and state levels through periodic meetings with the state committee chairmen and members.

ACKNOWLEDGMENTS

The Committee on Accident Prevention wishes to thank all chairmen of state accident prevention committees and all State Chairmen for their continued and increasing interest in the work of the Committee.

We would scarcely be able to function without the assistance given to us by the Executive Secretary, Dr. Christopherson, the understanding of the Executive Board of the Academy and the persistent, intense interest of our Presidents during each year.

The author wishes to acknowledge the valuable assistance of Miss Cecilia F. DiCicco, M.P.H., health educator, Greater New Bedford Children's Accident Prevention Program, in the preparation of this article. Sincere thanks also are expressed to Chester R. Kennedy, Jr., of the Division of Health Information of the Massachusetts Department of Public Health for art services in developing the charts; and J. Tuckerman Day, also of the Massachusetts Department of Public Health, for editorial assistance.

APPENDIX

Sources of Material on Accident Prevention

Accident Prevention Program
Bureau of State Services
U.S. Dept. of Health, Education, and Welfare
Public Health Service
Washington 25, D.C.

American Academy of Pediatrics
1801 Hinman Avenue
Evanston, Illinois

Equitable Life Assurance Society of the United States
Bureau of Public Health
393 Seventh Avenue
New York 1, New York

Metropolitan Life Insurance Company
One Madison Avenue

Prudential Life Insurance Company
Newark 1, New Jersey.

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11. Soule, A. B., Jr.: Personal communication.
17. Stewart, W. B.: Personal communication.
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**Comparative Study of Glucose and Fructose Metabolism in Infants with Reference to Utilization and to the Accumulation of Glycolytic Intermediates.**

Recently considerable interest has been directed at the comparative rates of utilization of glucose and fructose, administered intravenously. The present study was designed to carry out such a comparison using intakes of the carbohydrates which would provide sufficient calories to meet the maintenance requirements. The observations included a comparison of the extent of accumulation of certain acid metabolites and disturbances of the acid-base equilibrium which result from the rapid infusion of glucose and fructose. It was found that infusions of glucose and fructose in solution with electrolytes at 1 gm/kg/hr enabled both sugars to be utilized completely, without significant differences in the excretion of water, sodium and potassium. When the sugars were infused at a rate of 2 gm/kg/hr, 20% of the glucose and 9.9% of the fructose were excreted in the urine. Excretion of sodium in the urine with infusions of glucose led to loss of 79% of the intake, while for fructose the urinary excretion was 127% of intake, although no significant differences in excretion of water and potassium were noted. Infusions of fructose were accompanied by much greater increases of lactate and pyruvate in the blood than were caused by infusions of glucose. The urinary excretion of lactic acid was also greater with fructose than with glucose. It is stated that the superior utilization of fructose at rapid rates of infusion is not entirely advantageous because of the accompanying acidosis, which is of sufficient severity to make limitation of the rate of its infusion advisable.
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George W. Starbuck
Pediatrics 1958;22;761

The online version of this article, along with updated information and services, is located on the World Wide Web at:
/content/22/4/761