AMERICAN ACADEMY OF PEDIATRICS

Committee on Injury and Poison Prevention

Reducing the Number of Deaths and Injuries From Residential Fires

ABSTRACT. Smoke inhalation, severe burns, and death from residential fires are devastating events, most of which are preventable. In 1998, approximately 381 500 residential structure fires resulted in 3250 nonfirefighter deaths, 17 175 injuries, and approximately $4.4 billion in property loss. This statement reviews important prevention messages and intervention strategies related to residential fires. It also includes recommendations for pediatricians regarding office anticipatory guidance, work in the community, and support of regulation and legislation that could result in a decrease in the number of fire-related injuries and deaths to children.

ABBREVIATION. NFPA, National Fire Protection Association.

For persons of all ages, fires and burns are the fourth most common cause of unintentional injury-related death—after motor vehicles, falls, and poisoning by solids and liquids—causing more than 4000 deaths annually. Approximately 1000 of these deaths occur in children younger than 15 years. Among children younger than 1 year, fire- and burn-related deaths follow nonfirearm homicide and motor vehicle crashes as a leading cause of injury-related death. In children who are between 1 and 9 years of age, deaths from fire and burns are second only to those from motor vehicle injury.[1]

In 1998, an estimated 381 500 residential structure fires resulted in 3250 nonfirefighter deaths, 17 175 injuries, and approximately $4.4 billion in property loss.[2] Residential fires accounted for 74% of all structure fires, 81% of all fire-related deaths, and 74% of injuries resulting from fires. Home fires result in more than 90% of all unintentional fire- and burn-related deaths in children younger than 15 years.[3] Most fire-related deaths in all age groups occur as a result of smoke inhalation, rather than directly from burns.[4]

The rate of deaths from home fires for preschool children is more than double, relative to population, the rate for all age groups combined. In 1997, children playing with fire, usually matches or lighters, accounted for 8% of deaths from home fires and 2 of every 5 deaths from home fires in preschool children.[5,6] Also, young children may have difficulty escaping from burning buildings, even though a smoke alarm may be sounding.

Arson is thought or suspected to be the cause of 13% of 1993–1997 residential structure fires and to account for 19% of associated property loss. Children and adolescents younger than 18 years accounted for 52% of those arrested for arson in 1993–1997; more than one third were younger than 15 years.[7] Preteens may start fires in the course of an otherwise normal phase of development, but usually older juveniles who set fires often have serious psychological problems that may relate to stress, such as child abuse or learning disabilities.[7]

Each year, more than 50 000 acute hospital admissions result from the more than 1.25 million injuries from burns.[8] Although scalds make up a higher percentage of hospital admissions than burns from fires,[9,10] the fatality rate of those hospitalized from fires (12% in the first hospitalization) far exceeds that of other hospitalized patients with burns (3%).[9]

Data from 1996 indicate that cigarettes and other lighted tobacco products were the cause of 33% of residential fires that involved fatalities. Studies have demonstrated the feasibility of manufacturing "fire-safe" cigarettes that do not burn as long when they are not being actively smoked, which makes them less likely to ignite objects and cause a fire.[11]

Examination of trends from 1971 to 1991 shows a decline of approximately 50% in the rates of both fire- and burn-related deaths and acute hospital admissions for injuries from burns, most likely because of an increase in public fire and burn safety education, more widespread use of smoke alarms and automatic residential fire sprinkler systems, stronger building and fire codes and standards, and expansion in the network of burn treatment centers. Changes in lifestyle, such as declines in smoking and alcohol abuse, as well as changes in home cooking practices, have also contributed to this reduced incidence. The decrease in the number of hospitalizations for burn-related injury may, in part, also result from a treatment shift from the inpatient to the outpatient setting.[8]

Depending on the methodology,[12–14] annual economic loss from fire-related fatal and nonfatal unintentional injury is $3.8 to $61.4 billion. The figures keep rising, even though deaths and injuries keep falling, because of our growing awareness of the extent and longevity of harmful effects from fire injury.

PREVENTION MESSAGES AND INTERVENTION STRATEGIES

Deaths and injuries from residential fires may be mitigated by a variety of intervention strategies and

The recommendations in this statement do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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prevention messages, some of which are listed below. Others may be found in *Injury Prevention and Control in Children and Youth*, published by the American Academy of Pediatrics.[15]

- Children require close *adult supervision*.
- Functioning *smoke alarms* should be installed and maintained. Smoke alarms should be tested monthly, and batteries should be replaced at least once a year. Alarms with a flashing light in addition to a sound alarm should be installed in households with deaf or hard-of-hearing individuals, including one inside their bedrooms.
- An *escape plan* should be in place with at least 2 exits (when available) from every room of the house and a planned meeting place outside, in front, where everyone can wait for the fire department. The escape plan should be practiced at least every 6 months. (Practice sessions should not include potentially dangerous activities, such as climbing out of windows and using ladders.) If the home has an upper level, a noncombustible fire escape ladder should be available. A special escape plan that meets specific needs should be provided for small children, the aged, and individuals with disabilities. Neighbors of nonverbal, deaf, or hard-of-hearing children should be taught the sign language sign for "fire." Family and guests who are visiting overnight should briefly review a fire exit plan, just as if they were staying at a hotel.
- Preschool-aged children (3 years and older) can begin to *learn what to do in case of a fire*. Parents should teach children that the sound of a smoke alarm means go outside immediately and meet at a designated place and do not hide from firefighters. Because smoke rises, individuals should *crawl low on their hands and knees* under the smoke and toxic gases to exit a room filled with smoke. The cleanest air is 12 to 24 inches above the floor.
- In apartment buildings *elevators should not be used during a fire* because they may stop at a burning floor. Stairs should always be used to exit the building.
- Persons whose clothes catch fire should be taught to *stop, drop, and roll* to smother the flames and use cool running water immediately to begin treatment of the burn.
- Adults should learn from manufacturers' instructions or from their local fire department how to select and use a *fire extinguisher* properly; ie, when the fire is small and self-contained, and when they have a clear escape route available.
- Automatic home fire *sprinkler systems* are affordable and practical for many homes.
- All *caregivers* should be familiar with all possible exits of a house or apartment, instructed in the event of a fire about escape routes, instructed not to smoke, given emergency telephone numbers, and instructed to leave the house immediately with the children and call the fire department from a neighbor's house or an outside telephone.

Educational messages about the prevention of fires and burns are part of the work of the National Fire Protection Association (NFPA), the US Fire Administration, the US Consumer Product Safety Commission, and other organizations. The NFPA *Risk Watch* injury prevention curriculum, designed for children in preschool through grade 8 and their families, contains comprehensive fire and burn prevention messages, as well as other important injury prevention messages.[16] The NFPA also offers the *Learn Not To Burn* program, which focuses exclusively on fire and burn prevention.

RECOMMENDATIONS

1. As part of office anticipatory guidance, parents should be counseled about fire and burn prevention including adequate supervision of children, use of smoke alarms, escape plans, safe behavior in fires, and initial treatment of burns (stop, drop, and roll/cool and call), and other fire and burn prevention messages.[15] Material from the AAP TIPP (American Academy of Pediatrics, The Injury Prevention Program), and the NFPA may assist in this effort. Special planning information should be given to families having children with special needs.
2. School-aged children or adolescents who set fires are often crying out for help. They may have experienced a loss or failure, or may be stressed, abused, confused, angry, or frustrated. Pediatricians and parents should realize that these children and adolescents need psychological help; setting fires is a symptom of an underlying problem.
3. Pediatricians can work with other community members in the following activities:
   - encouraging adolescents and adults not to smoke;
   - working with media to increase public awareness of fire- and burn-related injury and prevention;
   - working with fire departments and local schools to provide comprehensive fire and burn prevention education to students and their families, and advocating for inclusion of this information in the school health education curriculum;
   - working with fire departments and other community agencies to distribute and install smoke alarms in giveaway programs targeted to areas at high risk for fires[17–19];
   - supporting the lowering of insurance premiums for sprinkler-protected buildings;
   - establishing or maintaining an adequate fire-response system; and
   - helping to sustain the network of burn centers that treat children.
4. Pediatricians should promote and support legislation and regulation to accomplish the following:
   - decrease the use of cigarettes and other smoking materials and/or promote the manufacture and substitution of fire-safe cigarettes—those that are less likely to start fires[15];
   - support a strong flame-retardant clothing law; and

- improve and enforce fire building codes and/or laws that require working smoke alarms and sprinkler systems in all new buildings and retrofit multiple-family rental units (building codes related to well-lighted hallways, wiring, appliances, heating devices, and sprinklers may also have an impact on reducing the number of fire-related injuries and deaths).[20]

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