Policy Statement—Prevention of Choking Among Children

abstract

Choking is a leading cause of morbidity and mortality among children, especially those aged 3 years or younger. Food, coins, and toys are the primary causes of choking-related injury and death. Certain characteristics, including shape, size, and consistency, of certain toys and foods increase their potential to cause choking among children. Childhood choking hazards should be addressed through comprehensive and coordinated prevention activities. The US Consumer Product Safety Commission (CPSC) should increase efforts to ensure that toys that are sold in retail store bins, vending machines, or on the Internet have appropriate choking-hazard warnings; work with manufacturers to improve the effectiveness of recalls of products that pose a choking risk to children; and increase efforts to prevent the resale of these recalled products via online auction sites. Current gaps in choking-prevention standards for children’s toys should be reevaluated and addressed, as appropriate, via revisions to the standards established under the Child Safety Protection Act, the Consumer Product Safety Improvement Act, or regulation by the CPSC. Prevention of food-related choking among children in the United States has been inadequately addressed at the federal level. The US Food and Drug Administration should establish a systematic, institutionalized process for examining and addressing the hazards of food-related choking. This process should include the establishment of the necessary surveillance, hazard evaluation, enforcement, and public education activities to prevent food-related choking among children. While maintaining its highly cooperative arrangements with the CPSC and the US Department of Agriculture, the Food and Drug Administration should have the authority to address choking-related risks of all food products, including meat products that fall under the jurisdiction of the US Department of Agriculture. The existing National Electronic Injury Surveillance System—All Injury Program of the CPSC should be modified to conduct more-detailed surveillance of choking on food among children. Food manufacturers should design new foods and redesign existing foods to avoid shapes, sizes, textures, and other characteristics that increase choking risk to children, to the extent possible. Pediatricians, dentists, and other infant and child health care providers should provide choking-prevention counseling to parents as an integral part of anticipatory guidance activities. Pediatrics 2010;125:601–607

INTRODUCTION

Choking is the blockage or hindrance of respiration by a foreign-body obstruction in the internal airway, including the pharynx, hypopharynx, and trachea. Airway obstruction can be fatal if it leads to serious impair-
ment of oxygenation and ventilation. Choking is a leading cause of morbidity and mortality among children, especially those who are 3 years of age or younger. This is largely because of the developmental vulnerabilities of a young child’s airway and the underdeveloped ability to chew and swallow food. Young children also commonly put objects in their mouths as they explore their environments. The most common objects on which children choke are food, coins, balloons, and other toys.

**FACTORS ASSOCIATED WITH THE ANATOMY AND FUNCTION OF THE AIRWAY**

An infant is developmentally able to suck and swallow and is equipped with involuntary reflexes (gag, cough, and glottic closure) that help to protect against aspiration during swallowing. Dentition initially develops at approximately 6 months with eruption of the incisors. Molars are required for chewing and grinding food and do not erupt until approximately 1.5 years of age. However, mature mastication abilities take longer to develop and remain relatively incomplete throughout early childhood. Young children and children with developmental and neurologic impairment also do not have the overall cognitive skills, behavioral control, or experience to chew well and eat slowly.

Despite a strong gag reflex, a young child’s airway is more vulnerable to obstruction than that of an adult in several ways. The smaller diameter is more likely to experience significant blockage by small foreign bodies. Resistance to air flow is inversely related to the radius of the airway to the fourth power, so even small changes in the cross-section of the airway of a young child can lead to dramatic changes in airway resistance and air flow. Mucus and secretions surrounding a foreign body in the airway will reduce the radius of the airway even further and may also form a seal around the foreign body, making it more difficult to dislodge by forced air, such as with a cough or Heimlich maneuver. The force of air generated by a cough in an infant or young child is less than that in an adult; therefore, a cough may be less effective in dislodging a complete or partial airway obstruction during early childhood.

**EPIDEMIOLOGY**

**Nonfatal Choking Episodes**

A complete description of nonfatal choking events among children is limited, because many of these events are transient, do not result in aspiration, and consequently do not result in visits to health professionals. Many episodes, therefore, are not reported. Choking events that result in emergency medical treatment or bronchoscopy are the most serious of episodes and have been well described. Data are lacking regarding the long-term consequences of brain hypoxia caused by nonfatal choking; however, the morbidity in these cases can be severe.

The Centers for Disease Control and Prevention conducted an analysis of nonfatal choking episodes among children aged 14 years or younger treated in US hospital emergency departments during 2001 on the basis of data reported through the National Electronic Injury Surveillance System—All Injury Program (NEISS-AIP). Of an estimated 17,537 children aged 14 years or younger who were treated for nonfatal choking, more than half (59.5%) were treated for food-related choking, approximately one third (31.4%) were treated for choking on nonfood items, and the cause of choking for the remaining 9.1% was unknown. Almost 13% of all these choking episodes were associated with coins, and 19% were caused by candy or gum. These findings are similar to those reported in a comparative retrospective analysis of foreign-body–related injuries to children from 1920–1932 and 1988–2000, confirming that food and coins are the most common foreign bodies. Coin-related choking episodes among children are usually transient, with the coin typically being swallowed. The coin usually passes through the gastrointestinal tract without problems but may lodge in the esophagus.

**Fatal Choking Episodes**

From 1972 to 1992, 449 deaths from aspirated nonfood foreign bodies among children aged 14 years or younger were recorded by the US Consumer Product Safety Commission (CPSC). Nearly two thirds (65%) of these fatalities were among children younger than 3 years. Latex balloons were associated with 29% of deaths overall. Choking on food causes the death of approximately 1 child every 5 days in the United States. Hot dogs accounted for 17% of food-related asphyxiations among children younger than 10 years of age in a 41-state study by Harris et al. Coins and toys account for most nonfood-related choking events among children. Purchasing toys for children...
with younger siblings poses a challenge to parents. They may find it difficult to meet the developmental play needs of the older child while addressing the safety needs of a younger sibling. Toys that are acceptable for older children sometimes have small or removable parts that can pose a choking risk to the younger brother or sister.

**High-Risk Shapes, Sizes, and Consistencies**

Of all children’s products, latex balloons are the leading cause of choking death, and most of these fatalities are among children younger than 6 years. At least 68 children died from choking on latex balloons from 1990 through 2004 in the United States. Uninflated and pieces of broken latex balloons pose a particular hazard because of their ability to conform to the child’s airway and form an airtight seal.

In addition to conforming objects, round, ovoid, or cylindrical objects such as balls, marbles, and spherical toys or toy parts pose the greatest risk of choking death. When these objects are approximately the same diameter as a child’s upper airway, they can completely occlude the airway with a snug fit and are difficult to dislodge with rescue maneuvers.

**Monitoring and Enforcement by the CPSC**

The Federal Hazardous Substance Act (FHSA) (Pub L No. 86–613 [1960]) was amended in 1994 by the Child Safety Protection Act (CSPA) (Pub L No. 109–248). The CSPA requires choking-hazard warning labels on packaging for small balls, balloons, marbles, and certain toys and games that contain small parts when these items are intended for use by children in defined age groups. Section 1501 of the FHSA defines a test of object size using the small-parts test fixture (SPTF). The SPTF is a truncated cylinder with a diameter of 3.17 cm (1.25 in), simulating the mouth, and a depth between 2.54 and 5.71 cm (1.00 and 2.25 in), simulating the pharynx (Fig 1). An object is considered a small part if it fits completely within the SPTF. The SPTF was developed, in part, on the basis of data regarding the dimensions of airway foreign bodies recovered by bronchoscopy by Chevalier Jackson in the early 1900s. Because of their high-risk shape, small balls are held to a stricter criterion to prevent choking. The CSPA requires that balls be at least 1.75 inches in diameter if they are intended for use by children younger than 3 years. The CSPA defines a ball as a spheroid, ovoid, or elliptical object that is designed or intended to be thrown, hit, kicked, rolled, bounced, or dropped.

In addition, the Consumer Product Safety Improvement Act of 2008 (Pub L No. 110–314) amended the FHSA to require choking-hazard warnings to be displayed on or adjacent to product advertisements on Web sites or in catalogs or other printed materials that provide a direct means for purchase or order of a product for which a warning is required under the FHSA.

**High-Risk Settings and Circumstances**

In a study that predated the CSPA, Rimell et al examined 101 foreign bodies that had caused a choking death and found that 14 passed requirements for use by children younger than 3 years. In another study on airway foreign bodies, Reilly et al concluded that greater child protection would be achieved if the diameter of the SPTF was increased from 1.25 to 1.75 in. Milkovich et al examined approximately 7000 foreign-body injuries from 15 countries and recommended the use of a 1.50-in-diameter test device for nonspherical objects and a 1.75-in-diameter test device for spherical objects. The ball test fixture defined in the CSPA has a 1.75-in diameter; however, there are spheroid, ovoid, or elliptical toys or toy parts that do not meet the definition of a ball but present the same cross-sectional profile to a child’s airway. Although these spheroid, ovoid, or elliptical nonball objects present an increased risk of fatal choking to young children, similar to the increased risk of fatal choking associated with balls, they currently are not held to the stricter choking-prevention standard applied to balls. Therefore, these gaps in choking-prevention standards for children’s toys should be reevaluated and addressed, as appropriate, via revi-
Nothing to add.
legislation and regulations to protect children against choking and injury on toys and other consumer products, there are currently no counterpart surveillance systems, laws, regulations, or dedicated resources to protect children against choking on food, yet food is more likely to go into a child’s mouth than a toy. A mandatory system is needed to label foods with appropriate warnings according to their choking risk, to conduct detailed surveillance and investigate food-related choking incidents, and to warn the public about emerging food-related choking hazards. As has been proposed through federal legislation, the US Food and Drug Administration (FDA) should be responsible for these measures and should work closely with the CPSC to integrate food-related hazards into product recalls and public notices. This collaborative effort would build on the support currently being provided by the CPSC to the FDA to identify food-related choking hazards. The NEISS-AIP currently collects information on food-related choking requiring an emergency department visit; however, more detail about the types of food and the choking events needs to be incorporated into the surveillance system. Enabling federal legislation with appropriate additional funding for implementing these changes should be enacted as needed.

Although some food manufacturers voluntarily label foods with choking warnings, all companies should provide appropriate warning labels, either voluntarily or through mandatory measures. Other countries are ahead of the United States in this regard. For example, Sweden has had age labeling on foods for infants and young children since 1979 and warning labels on prepackaged shelled peanuts since 1981 to prevent choking among young children. The FDA should collaborate with the US Department of Agriculture (USDA), which has jurisdiction over the safety of meat products such as hot dogs. There is a precedent for such collaboration; the FDA and USDA worked together on a National Task Force on Foods and Choking in Children convened by the AAP in 1983.

An example of the involvement of the FDA in ensuring children’s safety from food-related choking is its response to the hazard of gel candy. During a relatively short period, there were at least 6 choking deaths and a series of aspirations and near-deaths among children associated with gel candies containing the ingredient konjac. The dimensions (which approximated the diameter of a child’s upper airway), rounded shape, consistency, and slipperiness of the product contributed to a serious choking risk. Indeed, these characteristics are very similar to those of the rounded end of a hot dog, a known high-risk food for young children. These candies were packaged in rounded cups as individual mouth-size servings designed to be sucked out of the cups by the consumer. Unlike most gel products, these candies did not dissolve when in the mouth. The consumption method also contributed to the choking risk, because the candy was intended to be sucked out of its packaging.

In 2002, the FDA seized the candies at 1 manufacturer’s facility in California and issued general warnings against consuming products containing konjac. The FDA also issued an import alert by guest on January 18, 2018http://pediatrics.aappublications.org/Downloaded from the candy was in- tended to be sucked out of its packaging. The FDA also issued an import alert containing the ingredient konjac. The FDA also issued an import alert by guest on January 18, 2018
RECOMMENDATIONS

1. The FDA should establish a systematic, institutionalized process for examining and addressing the hazards of food-related choking, which should include the establishment of the necessary surveillance, hazard evaluation, enforcement, and public education activities to prevent food-related choking among children. Specifically, the authority and activities of the FDA should be enhanced to permit the agency to:

- Evaluate foods and require warning labels on foods that pose a high choking risk to children. The FDA should collaborate with the USDA to ensure that meat products also undergo similar evaluation and labeling.
- Recall food products that pose a significant and unacceptable choking hazard to the public. The FDA should collaborate with the USDA to ensure that a similar recall process exists for meat products.
- Establish a national food-related choking-incident surveillance and reporting system to warn the public of existing and emerging hazards. The NEISS-AIP of the CPSC should be modified to provide the surveillance function of this system.
- Conduct, in consultation with the USDA, CPSC, AAP, and other organizations, a widely publicized food-related choking-prevention campaign that is focused on children.
- Focus resources and prevention program efforts on high-risk groups, circumstances, and products that are identified through the surveillance system.
- Maintain highly cooperative arrangements with the CPSC and USDA, and information should be openly shared among these agencies.

2. Pediatricians, dentists, and other infant and child health care professionals should intensify choking-prevention counseling as an integral part of anticipatory guidance activities.

3. Pediatricians should continue to provide parents and caregivers guidance on appropriate food and toy selection with respect to choking prevention as outlined by the AAP.

4. Food manufacturers should design new foods and redesign existing foods, including meat products, to avoid shapes, sizes, textures, and other characteristics that increase choking risk to children, to the extent possible.

5. The CPSC should increase efforts to ensure that toys that are sold in retail store bins, in vending machines, or online have appropriate choking-hazard warnings; work with manufacturers to improve the effectiveness of recalls of products that pose a choking risk to children; and increase efforts to prevent the resale of these recalled products on online auction sites. Current gaps in choking-prevention standards for children’s toys should be reevaluated and addressed via revisions to the standards established under the CSPA or the Consumer Product Safety Improvement Act or via regulation by the CPSC.

6. Because it is impossible to prevent all choking episodes among children, cardiopulmonary resuscitation and choking first aid for children should be taught to parents, teachers, child care providers, and others who care for children, particularly children at high risk of choking.

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