

Promise and Challenges: Interventions for the Prevention of Unintentional Injuries Among Young Children

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Unintentional injury is the leading killer of children in the United States. Children under the age of 5 are at particularly high risk for death from injury. The evidence base for prevention programs in the area of unintentional injury is limited by a lack of rigorous research, inclusion of low-risk participants, and interventions that do not include behavioral skills training. The article presented here will discuss promising injury prevention programs for children below age 5 and will highlight program strengths and weaknesses. Interventions that prevent the leading causes of death among young children will be discussed, including car seat use, safe infant sleep, home hazard reduction, and caregiver supervision.

Keywords: child injuries, injury prevention, interventions

Unintentional injuries are the leading killer of children in the United States, accounting for an average of 12,175 deaths each year. Moreover, children ages 0–4 are among those at highest risk for death from unintentional injury (Borse et al., 2008). Among children ages 1–4, the most common causes of death include motor vehicle accidents, drownings, pedestrian injuries, and burns. The most common cause of injury death among children less than 1 year of age is suffocation (accounting for 66% of injury deaths; Borse et al., 2008).

Given the risk posed to young children from unintentional injuries, it is critical to create and disseminate effective, empirically supported prevention programs. This article will highlight empirically supported programs that are designed to prevent the most common fatal injuries to children ages 0–4. Specifically, we will highlight programs that focus on safe sleep practices to prevent infant suffocation and car seat programs to prevent motor vehicle injuries. We will also discuss programs designed to reduce home hazards and to increase caregiver

supervision to decrease the risk of other common injuries.

Although the field of public health plays a major role in injury prevention, the field of pediatric psychology also stands to contribute significantly to the prevention of child injuries. For example, appropriate infant car seat use may be increased with public health interventions such as legislation and public education. However, psychologists can provide individual training for parents to install and use car seats correctly. Injury prevention requires individual behavior change (Gielen & Sleet, 2003; Peterson & Mori, 1985), and psychologists, rather than public health professionals, possess the expertise to help individuals make behavioral changes. Moreover, the type of children who pediatric psychologists typically serve (i.e., those with chronic health conditions) are at an increased risk for unintentional injury (Diekema, Quan, & Holt, 1993; Schwebel & Brezaussek, 2011; Sinclair & Xiang, 2008; Xiang, Stallones, Chen, Hostetler, & Kelleher, 2005), making the role of the pediatric psychologist particularly important in the prevention of injuries in young children.

Unfortunately, the evidence base for effective injury prevention programs for young children is small and suffers from limitations. Few programs have been rigorously tested. In addition, some have only been tested with relatively low-risk families, although children in low-income,

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stressed families are at the highest risk for unintentional injury (Haynes, Reading, & Gale, 2003). Another frequent limitation is the provision of education without skill training. DiGiuseppi and Roberts (2000) noted that clinical interventions are most effective in creating behavior change when they combine health education and behavior change strategies, including demonstrations providing feedback and reinforcement. Programs that include behavioral skills training will be highlighted in the discussion to follow.

Child and Infant Car Seat Use

Motor vehicle accidents are the leading cause of child death by unintentional injury for children (Borse et al., 2008). In 2010, 291 children ages 4 and younger died as the result of being a passenger in a motor vehicle accident; 72% of those children were restrained and 28% were not (NHTSA, 2012). The use of child-care seats is key to preventing motor vehicle deaths among children. Approximately 303 children under the age of 5 were saved by the use of car restraints in 2010 (NHTSA, 2012). However, even when families do use seats to restrain children, they often use them improperly (Brown, Grondin, & Potvin, 2008). Decina and Lococo (2005) reported that 73% of caregivers in their sample displayed one or more critical car seat misuses. The most common misuses included loose seatbelt attachments to the car seat, loose harness straps, and improper positioning of harnesses (Decina & Lococo, 2005). The proper use of child safety seats has been found to reduce fatal injuries by 71% for infants and 54% for toddlers (NHTSA, 2012).

Thus, effective programs to improve car seat installation and use are critically important to reducing child injuries. Several community-based interventions designed to increase car restraint use have shown promising results. Turner, McClure, Nixon, and Spinks (2005) reviewed eight studies that examined the effectiveness of community-based interventions on car seat use in children. Community-based interventions typically include public education through media campaigns, targeted education, provision of car seats, and sometimes legislation. Research that reported an increase in car seat use found that use with

toddlers increased by 11% (Decina, Temple, & Dorer, 1994). Moreover, two programs that examined injury outcomes after community-based interventions found significant reductions (33–55%) in injury frequencies from pre- to posttest (Davidson et al., 1994; Durkin, Laraque, Lubman, & Barlow, 1999). Turner et al. (2005) concluded that although there is evidence for the effectiveness of community-based programs, there is a need for higher quality evaluation of programs to better develop evidence-based methods of intervention. Furthermore, although these community-based programs promote the use of car restraints, investigators did not examine proper installation and use.

Data on a promising intervention were recently published by Tessier (2010). The investigator examined a two-session intervention that combined educational sessions, provision of car seats, hands-on demonstrations, and safety checks to improve car restraint use in infants. The intervention targeted expecting parents in Hawaii. Participants were diverse in terms of socioeconomic status and were primarily Asian or Pacific Islanders. The first session of the program included a video about child passenger safety, brochures, a booklet from the National Highway Traffic Safety Administration, and a summary of the state laws regarding safety restraints. In the second session, the participants were provided with a car seat and the manufacturer instructions and were trained to install the car seat in their vehicle and to correctly place the child in the seat with the use of a doll. The parents then practiced and demonstrated the correct installation and use of the car seat before leaving the training. The trainings were conducted by certified Child Passenger Safety Technicians. A control group of parents only received the educational component and the car seat with instructions and did not receive the demonstration or an opportunity to practice. At a follow-up check (when the child was 2–3 months old), parents in the intervention group were over 4 times more likely to correctly use their car seats than those in the control group. Furthermore, the rate of errors was 33% less in the intervention group than in the control group. These results suggest the hands-on behavioral practice is an important addition to an educational intervention.

Conclusions: Strengths, Limitations, and Challenges

Research suggests that a combination approach that includes broad community messaging, targeted education, and provision of car seats may increase car seat use. However, as noted above, proper installation of car seats is important to reducing fatalities. Thus, training that provides parents with opportunities to practice proper installation with feedback and safety checks may be needed to significantly affect child safety.

However, it is important to note that there may be barriers to implementing skills-based training. The implementation of a skills-based training program requires more resources than a community-based intervention that only provides educational materials. Another potential challenge is that it may be difficult to recruit families to attend intensive programs. Skills training in the hospital setting, after delivery of the newborn and before discharge, may be the best time to provide such training. In such a model, car seat technicians could help to make sure that each family has the car seat installed and the infant correctly secured in the seat before leaving the hospital. Such programs should also include provision of low-cost or free car seats to families who lack the resources to purchase one at full price.

Safe Sleep

Safe sleep practices are critically important for reducing the risk of infant suffocation. Suffocation deaths account for approximately two thirds of deaths by injury for children younger than age 1 (Borse et al., 2008). Estimates indicate that there are approximately 400 infant deaths every year due to accidental strangulation and suffocation in bed (Borse et al., 2008). Such deaths most commonly occur during sleep and are often caused by being face down in soft bedding, entrapment between a mattress and a wall, or strangulation from something near the sleeping surface (e.g., a cord; Carlberg, Shapiro-Mendoza, & Goodman, 2012). Sudden infant death syndrome (SIDS) also often occurs during infant sleep. SIDS is the sudden death of an infant under the age of 1 in which the cause of death is unknown even through investigation (Task Force on SIDS, 2011a). Approximately

60 deaths per every 100,000 births can be attributed to SIDS. This number has declined 53% since 1991 because of education regarding safe sleep (Task Force on SIDS, 2011a). Differentiating accidental suffocation from SIDS is difficult because SIDS can be attributed to suffocation, asphyxia, or entrapment. However, SIDS can also be due to other factors such as infection, ingestions, metabolic diseases, cardiac problems, or trauma (Task Force on SIDS, 2011a). Given their similarities, many of the findings regarding SIDS risk factors and prevention are similar to those for accidental suffocation.

Some populations are at a higher risk of having a child die from accidental strangulation or suffocation. Infant characteristics that increase risk are male gender and preterm birth. Maternal characteristics include younger age, fewer years of education, having other children, smoking during pregnancy, lack of prenatal care, and African-American or American-Indian ethnicity (Carlberg et al., 2012).

Other risk factors for suffocation or SIDS include infant sleep location (e.g., bed-sharing) and positioning. Bed-sharing (i.e., when an infant sleeps in the same bed or sleep surface as someone else) is hazardous because it increases an infant's risk of suffocating by overlaying, entrapment, or wedging (Fu, Colson, Corwin, & Moon, 2008). Krouse et al. (2012) reported that 60% of women in their study reported bed-sharing once their infant was older than 1 month. Reasons for bed-sharing that women reported included ease of breastfeeding, increasing the maternal-child bond, and checking on the infant more frequently (Krouse et al., 2012). African-American and women of low socioeconomic status are more likely to bed-share than are other women, suggesting that there may also be cultural factors associated with women's decisions to bed-share (Fu et al., 2008; Joyner, Oden, Ajao, & Moon, 2010; Shapiro-Mendoza, Kimball, Tomashek, Anderson, & Blanding, 2009).

An additional risk factor for infant suffocation is placing an infant on their stomach (i.e., in the prone position) or side to sleep. It is recommended that infants are placed on their backs, in a supine position, to sleep (Task Force on SIDS, 2011a, 2011b). Research by Chung-Park (2012) suggests that a significant portion of parents do not place their children in the supine position

(31% of the sample) despite reporting beliefs that this position is safest. Many parents who do not choose the supine position do so because of perceived infant comfort, infant preference, and fear of choking (on infant's own vomit; Chung-Park, 2012; Task Force on SIDS, 2011b). It is interesting to note that Chung-Park (2012) found that parents' attitudes and opinions about safe sleep were significantly associated with sleep practices, but knowledge was not. This highlights the importance of taking into account a caregiver's personal opinions or beliefs while educating them about safe sleep positions.

On the basis of the research on SIDS and other suffocation-related deaths, the Task Force on Sudden Infant Death Syndrome (2011a) recommends several safe sleep methods to help prevent sleep-related fatalities, including placing infants on their backs to sleep; using a firm sleep surface covered by a fitted sheet; room-sharing with an infant without bed-sharing; removing loose bedding or soft objects from the sleep surface; avoiding overheating the infant; receiving prenatal care before giving birth; avoiding smoke, alcohol, and illicit drug use prenatally and after birth; breastfeeding if possible; providing a pacifier at bedtime; avoiding commercial devices used to reduce the risk of SIDS; and supervising infants during awake tummy time.

To encourage families to follow these guidelines, the Safe to Sleep campaign (formerly known as the Back to Sleep campaign) was launched to educate families and health-care providers about safe sleep methods to prevent SIDS (Safe to Sleep public education campaign, 2013). The Safe to Sleep campaign provides parents and health-care providers with educational materials on safe sleep strategies on the basis of the American Academy of Pediatrics Task Force on SIDS (Safe to Sleep public education campaign, 2013; Task Force on SIDS, 2011a). The campaign relies on community members to spread safe sleep messages and practices in their communities. The website for the campaign offers materials to educate and increase awareness about safe sleep practices (<http://www.nichd.nih.gov/sts/campaign/outreach/Pages/default.aspx>; see Table 1).

Since the Safe to Sleep campaign began, the overall SIDS rate in the United States has declined by more than 50% (Task Force on SIDS, 2011a; Shapiro-Mendoza et al., 2009). How-

ever, deaths by accidental strangulation or suffocation have unfortunately increased during this same time period (Shapiro-Mendoza et al., 2009). Such an increase may be due to advances in death scene investigations and stricter adherence to the definition of SIDS; deaths that were previously diagnosed as SIDS may now be more likely to be determined to be due to suffocation (Schnitzer, Covington, & Dykstra, 2012). Some have suggested that more rigorous and evidence-based training for health-care providers and nurses is needed so that they can provide their patients with appropriate guidance about safe sleep in the antepartum and postpartum periods (Mason, Ahlers-Schmidt, & Schunn, 2013; Price, Hillman, Gardner, Schenk, & Warren, 2008). Indeed, research suggests that pediatric nursing staff is inconsistent in their use of safe sleep practices (Grazel, Gibbons Phalen, & Polomano, 2010).

The American Academy of Pediatrics (AAP) developed an educational curriculum called *AAP Reducing the Risk of SIDS in Child Care Speaker's Kit* to train health-care providers in safe sleep practices. Moon, Calabrese, and Aird (2008) evaluated the effect of this program on changing child-care providers' knowledge, attitudes, and practices regarding infant safe sleep practices. The model was delivered in four states, including California, Louisiana, Montana, and Pennsylvania. The investigators used a train-the-trainer approach; professionals (i.e., nurses, child-care consultants, health educators, other health-care professionals) were identified to be trained in the AAP model to then train child-care providers in child-care centers. Trainers attended a 1-day educational session that was led by a pediatrician or other health educator. The training included education about risk factors for SIDS, statistics on SIDS, safe sleep practices, barriers to implementing safe sleep practices, and additional suggestions for developing appropriate safe sleep policies in the child-care environment. Once they were trained, the trainers then taught the curriculum to staff at child-care centers.

The program was evaluated using a randomized controlled trial (Moon et al., 2008). Investigators conducted pretest and 3-month posttest unannounced visits to child-care centers to observe infant sleep practices and to administer questionnaires about policies and practices regarding infant sleep. Before the intervention, only 60% of

Table 1
Safety Resources for Practitioners and Caregivers

Topic	Organization	Website	Information Provided
Car seat use	National Highway Traffic Safety Administration	www.nhtsa.gov	Provides information about car seats and installation.
	SeatCheck	www.seatcheck.org	Provides information on car seat safety checks around the country; tips and tools regarding seat belt and car seat usage.
Safe sleep	National Institute for Child Health and Human Development	http://www.nichd.nih.gov/sts/campaign/outreach/Pages/default.aspx	Provides information on SIDS, accidental strangulation and suffocation, and safe sleep procedures; presents myths and facts regarding safe sleep.
Home safety	SafeCare	http://safecare.publichealth.gsu.edu	Provides information on SafeCare, an evidence-based home visitation program for families with a history of or at risk for child maltreatment.
General child safety	Safe Kids Worldwide	http://www.safekids.org	Provides safety tips by age and risk; information about car seat use; tools for parents, safety professionals, educators, and press regarding child safety; links to safety programs; recall information on products.
Child development	Zero to Three	http://www.zerotothree.org/child-development/brain-development	Provides basic developmental milestone information for parents and caregivers for children of all ages.
	American Academy of Pediatrics	http://www.healthychildren.org	Provides information about a range of topics regarding child well-being, including developmental stages, child safety, and child health.
Low-cost or free safety materials and resources	WIC	http://www.fns.usda.gov/wic/women-infants-and-children-wic	Some WIC programs offer free car seats or other safety devices for low-income families; varies by county.
	United Way	http://www.unitedway.org	May provide free safety devices or other resources to families; varies by county or state.

Note. WIC = Women, Infants, and Children.

child-care providers were aware of the AAP recommendation to place infants on their backs to sleep. This increased to 81% in the intervention group (65% in the control condition). In addition, significant improvements were observed in the intervention group with regard to increases in supine placement and decreases in prone and side placement, whereas the control group only showed a significant decrease in prone placement.

However, observations indicated lower frequency of safe sleep practices than were reported by child-care providers, indicating the importance of direct observations of sleep practices. Moreover, providers who were African American, who had less education, or who cared primarily for African-American children were less likely to believe that supine positioning was important for child safety (Moon et al., 2008).

Moon, Oden, and Grady (2004) developed an intervention to specifically target African-American parents and other family caregivers to increase safe sleep practices. The authors provided an educational intervention at a Women, Infants, and Children clinic and tailored the material to be culturally appropriate. The intervention was part of a larger educational program to improve prenatal and infant nutrition and safety, and attendance was required for participants to earn food vouchers. The intervention included a small group discussion of safe infant sleep practices led by a trained health educator. The investigators assessed caregivers' reports of their plans for infant sleep practices before and after the intervention as well as reports of sleep practices during a 6-month follow-up phone survey. After the intervention, parents reported that they were more likely to place their infants on their back to sleep (85% vs. 58% before the intervention). A subgroup of participants was compared to a control group who did not attend the intervention. Parents who attended the intervention were more likely (83%) than the control group (59%) to report placing their infants on their back and were less likely to bed share (Moon et al., 2004).

Finally, Mason and colleagues (2013) developed an intervention to train nurses and parents to improve safe sleep for infants in the postpartum hospital areas. The investigators consulted with hospital nursing staff and the SIDS Director to plan the intervention. First, the investigators developed a poster that outlined the hospital's new safe sleep policy. The poster included a Declaration of Safe Sleep Practices and a place to sign so that nurses could commit to practice safe sleep. The poster also included baseline data that the investigators had gathered about the sleep environment of infants in the hospital. Second, parents were required to watch a safe sleep video within 24 hr of arrival to the unit. Third, the hospital posted safe sleep posters from the National Institute of Health and Human Development in each postpartum room, and nurses used these posters to discuss safe sleep with the families. Finally, nurses were asked to check the infant sleep environment and position each time they conducted a medical assessment on the infant. Nurses then provided contingent feedback to parents. Specifically, when infants were found to be in appropriate sleep positions and environments, nurses

praised the parents. When infants were not in safe circumstances, nurses provided instruction to the family (Mason et al., 2013).

An examination of this program found that safe sleep practices improved significantly after the intervention. The percentage of infants who were found to be sleeping safely increased from 25% at pretest to 58% postintervention. Moreover, at postintervention, 0% of parents reported that they planned to bed share after being discharged from the hospital. The authors suggest that the intervention approach helped to increase consistency between nurses. Furthermore, modeling and teaching parents while in the hospital environment helped to provide more effective education. A limitation of this study is that the self-report data came primarily from Caucasian families with relatively high levels of education. The authors did not report information about the ethnic or socioeconomic make-up of the families who were included in the observational component of the study (Mason et al., 2013).

Conclusions: Strengths, Limitations, and Challenges

Promising programs have been developed to educate those caregivers who are most critical to promoting infant safe sleep, including parents, postpartum nurses, and child-care providers. Strengths of the programs include inclusion of care providers in planning of interventions, direct observation and feedback to caregivers regarding their safe sleep practices, early intervention (before giving birth or while still in the hospital), and tailoring programs to be culturally appropriate. However, there are several limitations and challenges to implementing the programs discussed above. Implementation of programs created to train nursing or daycare staff would require institution-wide changes that may be challenging to implement depending on the resources and commitment to safe sleep practices. In addition, some health-care providers may have attitudes and beliefs that prevent them from using safe sleep practices (Price et al., 2008). Price and colleagues (2008) found that many nurses' concerns about vomiting and aspiration during back sleeping affected their teaching methods (Price et al., 2008). The investigators addressed this problem by providing the nurses with facts about the safety of

back sleeping (Price et al., 2008). In general, programs can address caregivers' or providers' inaccurate attitudes and beliefs with the provision of factual information about safety. Table 1 provides information about resources that can be used to help address such beliefs.

In addition, little research has been conducted on the success of safe sleep programs with families from different ethnic groups and socioeconomic backgrounds. Cultural beliefs and practices may play a significant role in determining whether families and care providers are willing to engage in safe sleep practices. Finally, it may be important to create interventions that incorporate home visits to provide demonstrations and practice to parents to ensure that caregivers are well versed in using safe sleep practices. Home visits would also allow interventionists to ensure that caregivers have appropriate equipment (i.e., a crib or bassinet) and a safe location for infant sleep.

Reduction of Home Hazards

Research suggests that most (55%) unintentional child injuries occur in the home, making home hazard reduction an important means of injury prevention (Phelan, Houry, Kalkwarf, & Lanphear, 2005). Common home hazards include burn hazards (e.g., hot water from faucets), fall hazards (e.g., open stairways), strangulation hazards (e.g., loose cords), poisoning hazards (e.g., cleaning products or medications), choking hazards (e.g., small toys), and drowning hazards (e.g., bathtubs, buckets full of water; American Academy of Pediatrics, 2013). Given the risks posed to children in the home environment, many injury prevention programs have focused on reducing home hazards by helping caregivers to remove hazards (e.g., locking up medications) or install safety devices (e.g., baby gates). Some of these programs have demonstrated success in reducing home hazards or increasing safety knowledge (Powell, Malanchinski, & Sheehan, 2010; Swart, Van Niekerk, Seedat, & Jordaan, 2008), but few have evaluated the effects of such programs on actual child injury outcomes (e.g., injury frequency; Kendrick et al., 2007).

Among those programs that have been evaluated for their effect on injury frequency, very few have found favorable results in rigorous studies. A recent meta-analysis conducted by

the Cochran Collaboration reported that none of the studies they reviewed were effective in reducing child injury frequencies or severities (Kendrick et al., 2007). However, a recent randomized controlled trial by Phelan et al. (2011) did find success in reducing children's injuries with a home hazard reduction program. The authors used one-time home visits in which research assistants identified home hazards and installed safety equipment. The authors found that children in the treatment group had significantly fewer modifiable medically attended injuries than those in the control group (Phelan et al., 2011). This study showed promising results; however, the sample was relatively high income (medium family income of \$70,000). Given that low-income and highly stressed families are at highest risk for injury (Haynes et al., 2003), such programs should be tested with higher risk families.

One limitation of existing home hazard programs is that they typically use only didactic methods for teaching parents about home hazard removal and assist parents in removing hazards or installing safety devices (King et al., 2001; Sznajder et al., 2003). Such programs are effective at increasing caregiver knowledge and temporarily removing hazards or installing safety devices; however, it is unclear whether these programs are effective at creating behavior change so that parents can effectively prevent child injuries on their own. Behavioral interventions, which focus on skill acquisition, may be needed to independently train parents to identify and remove home hazards (Roberts, Fanurik, & Layfield, 1987).

SafeCare (Lutzker & Bigelow, 2002) is a behaviorally based, empirically supported home visiting program designed to treat child neglect (for children ages 0–5) that may be effective as an intervention to reduce unintentional child injuries; however, it has not been tested as such. SafeCare includes three modules: home safety, home health, and parent-child interaction. The program has served families who have been mandated to child welfare services and those who have been referred for voluntary participation. The program uses behavioral methods (i.e., modeling, rehearsal with feedback) to train parents to identify hazards and reduce them independently. To achieve skill acquisition, identification and removal of hazards is first modeled

by treatment providers; then parents practice identifying hazards with positive reinforcement and corrective feedback from treatment providers. Parents are assigned homework to independently identify and remove additional hazards between sessions, and therapists provide feedback and correction as needed at subsequent sessions (Lutzker & Bigelow, 2002). Parents also receive a home safety kit to assist with child-proofing their homes. The home hazard portion of the program typically lasts for six to seven sessions, and parents must meet a skill criterion before they “pass” the module.

Research evaluating the home hazard portion of SafeCare found a significant reduction in the number of home hazards from pretreatment to posttreatment (Gershater-Molko, Lutzker, & Wesch, 2003). An advantage of the SafeCare program is that it has been shown to work with maltreating families, who share many similarities with families who are at highest risk for unintentional injuries, such as low socioeconomic status and higher rates of stress (Peterson & Brown, 1994). Moreover, research has found that the program is perceived to be culturally appropriate and effective among families of various ethnic backgrounds (i.e., American Indian and African American) and among low-income families (Chaffin, Bard, Bigfoot, & Maher, 2012; Chaffin, Hecht, Bard, Silovsky, & Beasley, 2012; Damashek, Bard, & Hecht, 2012). Information about SafeCare can be found at <http://safecare.publichealth.gsu.edu/> (see Table 1).

Conclusions: Strengths, Limitations, and Challenges

Programs to reduce home hazards are an important method of reducing fatal and non-fatal child injuries. Although many programs have used home visits and removal of hazards, few have found a reduction in actual injury rates. The successful intervention noted previously by Phelan et al. (2011) used a relatively low-risk sample. The home hazard component of the SafeCare program, developed for maltreating families, may be a promising intervention, but it has not been tested in terms of its effectiveness in reducing injury risk. However, one downside to the program is that it is an intensive program that lasts longer than most home hazard reduction

programs and thus requires more resources to implement. It might be beneficial to investigate whether there is an added benefit to a more behaviorally based and intensive program such as SafeCare in comparison to a less intensive program.

Caregiver Supervision

Although reduction of home hazards is an effective prevention strategy, it is also important for caregivers to closely supervise their young children. Landen, Bauer, and Kohn (2003) reported that 43% of injury deaths in Alaska and Louisiana were due to inadequate supervision. Moreover, many recent studies have found that closer supervision is linked to lower injury rates (e.g., Damashek, Williams, Sher, & Peterson, 2009; Morrongiello, Corbett, McCourt, & Johnston, 2006). Unfortunately, creating interventions to address caregiver supervision may be challenging. There are no clear-cut standards for what level of supervision is appropriate, and supervision needs change based on children’s developmental level and characteristics of the environment (Peterson, Ewigman, & Kivlahan, 1993).

Despite these challenges, interventions to educate caregivers about how to supervise young children are needed. However, very few programs have been developed. One recent study evaluated the effects of an educational program designed to prevent dog bites on parents’ supervision (Morrongiello, Schwebel, et al., 2013). Although the program included information for parents about appropriate supervision, the study did not find an increase in parents’ levels of supervision around strange dogs. Because there has been such a lack of innovation in this area, the following discussion will focus in-depth on a recently developed program called “Supervising for Home Safety” (Morrongiello, Zdzieborski, Sandomierski, & Munroe, 2013).

Supervising for Home Safety is a 4-week intervention that was designed to train parents in appropriate supervision for children ages 2–5. The program consists of the presentation of a video about child injuries, a follow-up discussion, and 1 month of parent home practice (Morrongiello, Schwebel, et al., 2013). The video portion of the intervention is designed to raise parents’ awareness about the risk and con-

sequences of injuries, educate parents about the role that supervision can play in preventing injuries, and empower parents to implement effective supervision strategies. The video contains information about the effect of injuries and common types of injuries, testimonials by mothers about injuries that occurred to their children, developmental information about children's changing abilities and their risk for injury, information about the role of supervision in preventing injuries, and suggestions for strategies to improve supervision.

After viewing the video, parents engage in an individualized structured discussion with an interventionist. During the discussion, parents are asked to create a radio ad in which they advocate for the importance of close supervision. Parents are also asked to identify barriers to their own use of supervision and to generate realistic solutions to overcome the identified barriers. The interventionist assists the parent in using a problem-solving approach called "ALTER" (A = activities of the child or parent, L = location of the child or parent, T = timing of an activity, E = environment, R = resources) to address barriers to supervision (Morrongiello, Sandomierski, Zdzieborski, & McCollam, 2012, p. 605). Before leaving the discussion with the interventionist, the parents sign a behavioral contract, indicating that they will practice the strategies and initial the contract when they engage in supervision practices. Finally, parents are sent home with a card that lists their identified barriers and solutions to supervision and engage in a month-long practice period.

Results of a randomized controlled trial (RCT) of the Supervising for Home Safety program found that parents in the intervention condition showed significant increases in the amount of supervision that they provided to their children on the basis of self-report (diary reports) and observational data (Morrongiello, Schwebel, et al., 2013). Similar improvements were not found in the control condition. Another RCT found that the parents in the program reported increased appraisals of their children's injury risk and their beliefs in the need to supervise at post-test, whereas those in the control condition did not (Morrongiello, et al., 2012).

Conclusions: Strengths, Limitations, and Challenges

Interventions to educate caregivers about the importance of close supervision and training them how to supervise closely are needed. The Supervising for Home Safety intervention (Morrongiello, Schwebel, et al., 2013) is very promising and has been found to increase caregiver supervision using a rigorous design. One important limitation of the research on this program, however, is that it was tested with socioeconomically advantaged families. It would be important to examine this intervention with low-income families. Research suggests that low-income families may face additional struggles with regard to keeping their children safe. A qualitative study with low-income mothers found that although mothers were concerned about keeping their children safe, they lacked resources to reduce hazards in their homes, resulting in increased need for close supervision (Olsen, Bottorff, Raina, & Frankish, 2008). For example, mothers could not afford to buy safety equipment or lived in dilapidated homes with unresponsive landlords. Moreover, they could not afford quality day-care that would provide a break from the demanding task of closely supervising a young child. Mothers also expressed concerns about protecting their children from potentially dangerous neighbors who were involved in illegal activities (Olsen et al., 2008). Thus, low-income families may face barriers to supervising their children that may be more difficult to problem solve during a relatively short intervention. Such families may need a slightly more intensive intervention that includes home visits to problem-solve barriers to supervision. It is possible that the Supervising for Home Safety program may be effective for low-income families if providers were trained to be aware of barriers that low-income families face. In addition, the intervention may be more successful if it were delivered in the home to make it easier to assist caregivers in finding solutions to supervision challenges. It would also be important to examine low-income caregivers' reactions to the video. If the video features middle- or high-income families, it may be difficult for lower-income caregivers to relate to the mes-

sages being presented. Finally, the study mentioned previously (Morrongiello, Schwebel, et al., 2013) did not evaluate the effect of the intervention on children's injury risk. It is important to examine whether the intervention reduces the number of injuries that children sustain.

Summary and Conclusions

Although unintentional injuries are the leading killer of children (Borse et al., 2008), the development of programs to prevent unintentional child injuries has not kept pace with those designed to prevent other risks to children, such as mental health problems or child abuse and neglect. Additional rigorous research is needed to identify programs that are effective with those populations who are most at risk for unintentional injuries. Evidence suggests that interventions that use behavioral skills training are likely to be most successful (DiGuseppi & Roberts, 2000). However, one drawback of such interventions is that they require more resources than purely educational interventions. However, the expenditure on such programs may pay off in terms of the large costs associated with child injuries. Indeed, the estimated total cost (including medical costs and lost wages) for unintentional child injuries treated in U.S. hospitals in 2005 is more than \$23 billion (Centers for Disease Control and Prevention, 2013). Cost-effectiveness studies would help to determine whether intensive behavioral programs are worth the investment. Once effective and cost-effective interventions are identified, the field must move forward by conducting research on the dissemination of such programs. For example, researchers might investigate whether programs are effective for various ethnic groups or whether modifications are necessary. Researchers may also need to examine effective ways to incorporate such interventions into already existing systems, such as hospitals, daycare centers, and existing parenting interventions.

As noted above, pediatric psychologists can play an important role in preventing injuries among young children. Clinicians can educate and train caregivers to make environmental and behavioral changes that can keep young children safe. For example, during well-baby

visits, psychologists working in primary care clinics can provide anticipatory guidance to caregivers about safety precautions for their children (e.g., safe sleep, appropriate use of car seats, safety-proofing the home). Through brief conversations and the use of motivational interviewing, psychologists can also help caregivers problem-solve ways to address barriers (e.g., lack of resources, inaccurate information) to implementing safety measures. As noted above, psychologists are in a good position to provide these services because they are especially skilled in assisting people in making behavioral changes rather than simply providing didactic information. Psychologists can also provide information and resources to caregivers when injured children are seen for care and can help to troubleshoot ways to prevent similar injuries from occurring in the future. Table 1 of this article provides information about educational and concrete resources that might assist in these tasks.

In conclusion, the foregoing discussion provides information about several promising interventions for preventing the leading causes of injury deaths among children ages 0–4. Safe sleep interventions have shown the most promise to date. Additional development and research on effective interventions for proper car seat use, reduction of home hazards, and caregiver supervision is still needed to effectively reduce the risk of injury in young children. The article presented here is somewhat limited in scope in that it only focused on some of the most common causes of injuries among children ages 0–4. However, Schwebel and colleagues (in press) have published a tandem article in the *Journal of Pediatric Psychology* that systematically reviews behaviorally based injury prevention approaches for child pedestrian injuries, which also pose a serious risk to children in this age range as well as older children. The authors reported evidence that behaviorally based interventions are effective in improving children's pedestrian safety behavior. Several effective interventions were reported; similar to the article presented here, the authors note the need for broader dissemination of effective strategies. The article is an important addition to our understanding of effective ways to prevent unintentional injuries among

young and older children and provides important direction for the field of injury prevention.

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