



Injury Prevention: Falls

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Topic

[Injury prevention](#)

Introduction

As children learn to explore and master their environment, stumbles, tumbles, trips and falls are typical and often “expected” consequences of learning to walk, run, jump and climb. Luckily, most falls result in only bumps and bruises. A considerable number of falls, however, result either in death or in short- or long-term disability. Because falls are the most common injury event, and because they frequently result in severe consequences, falls are an important part of the injury burden that should be explored.

Subject

As defined by the World Health Organization, a fall is “an event which results in a person coming to rest inadvertently on the ground, the floor or a lower level.”¹ Falls can occur on the same level as when a child trips or loses his balance, or from one level to another as when a child falls from a window, down the stairs, or off furniture. When these events result in medical care or are fatal, they are coded as fall injuries.

Several factors contribute to the extent of the injury from a fall. Higher distances are more likely to generate injury. The greater the energy-absorbing surface upon which the victim lands, the less severe the injury is likely to be. Individual differences in anatomy, such as bone structure and fat composition, also affect injury severity and depend in part on the individual’s age.^{2,3}

Problems

The World Health Organization identifies falls as one of the leading causes of injury burden in the world for children ages 0-4 and acknowledges the inequalities that exist in childhood death and injury rates from falls.⁴ Worldwide fall death rates vary by country income level and by child gender. For instance, girls living in the high-income countries within the Americas have the lowest fatal fall injury rate (0.1/100,000) while boys in the low- and middle-income countries of the Eastern Mediterranean have the highest (3.0/100,000).⁵

Among all unintentional injury deaths in the United States in 2007, falls ranked tenth among children younger than ten years of age.⁶ According to an analysis of data on children younger than 15 by Ballesteros and colleagues,⁷ for every child injury death due to falls, there are 19,000 non-fatal fall injuries seen in an emergency department. Non-fatal falls among U.S. children consistently ranked first for each age group (< 1, 1-4, 5-9, 10-14) as the leading cause of non-fatal injuries treated in hospital emergency departments.⁸

Internationally, non-fatal falls account for between 25-52% of all medically treated injuries among children.^{9,10} In the European Union, specifically, fall-related mortality varies considerably. Children from the Russian Federation, Kyrgyzstan and Belarus have a 22 times greater risk of dying from a fall compared to children in the lowest risk group countries, namely Georgia, Sweden and the United Kingdom.¹¹

Research Context

Most research has been conducted in developed countries, although the burden is great in low- and middle-income countries, where the need for reliable and valid data is critical. The research context is complex because there are so many varied circumstances under which children of different ages fall and sustain injury – from rolling off a changing table to falling from playground equipment. Risk factors, and therefore the appropriate prevention options, vary greatly. There are few truly passive countermeasures (e.g., energy absorbing surfacing in playgrounds), although there are many effective strategies that require a limited degree of active engagement by adults – e.g., installing window guards and stair gates. On the other hand, there are numerous supervision-related strategies for parents, such as never leaving a baby on a changing table and monitoring their natural climbing behaviours. There are many challenges to defining adequate supervision and demonstrating its effectiveness across the spectrum of ages and behaviors relevant to children's injuries, and supervision as a prevention strategy has not received much research attention.

Key Research Questions

How can we most accurately describe the burden of fall-related injuries?

How can we address the inequalities in fall related morbidity and mortality, both within and among countries and among different socioeconomic groups?

How can we better understand parents' protective behaviours and the relationship between the use of safety devices and the potential for reduced supervision?

How can the built environment be (re)designed with the needs and abilities of children in mind to minimize their falls risks?

What environmental and policy changes are necessary to reduce falls in children?

Recent Research Results

Improvements have been made in data collection efforts globally but the availability of accurate, timely falls data vary greatly among countries. Surveillance reports are increasingly being published from the United States¹² as well as from other countries around the world.^{13,14,15} While these data cover multiple types of injuries, falls among children are consistently identified as major contributors to the overall burden of injury.

Consistently, these findings document the higher rates of fall injuries in males compared to females.

Other risk factors related to falls differ with age and development of the child, and the conditions of the home and community environment within which the child interacts. Infant falls result commonly from being dropped by an adult or from a fall from furniture.¹¹ Children between the ages of 1-3 are most likely to fall from stairs and steps, windows, balconies, furniture and play equipment.¹¹⁻¹⁶ Falls in older children are common from playground equipment,¹⁷ and from heights like fire escapes, balconies and roofs.¹¹⁻¹⁶⁻¹⁸

Finally, another group of risk factors relates to the home environment, especially steps and stairways, windows above ground level and balconies. Handrails on stairs offer some protection, yet a recent U.S. survey found that 43% of homes with young children and stairs did not have banisters or handrails.¹⁹ Stair gates are recommended for homes with infants and toddlers, yet their use does not appear to be widespread, with only one-quarter to one-third of families observed to be using them.^{20,21} Balconies with railings more than 4 inches apart and windows within two feet of the floor have been found to be associated with more falls among children.²² Window locks or safety guards are recommended for homes with floors above ground level, yet a national survey recently found that 73% of households in which children live or visit did not have such devices installed.¹⁹ Finally, there appears to be an increased risk of injury and more serious injury from bunk beds relative to conventional beds.^{23,24}

Strides have been made in better understanding caregivers' protective behaviours related to falls. For example, parents report being more permissive with risk taking (including during climbing, jumping and running activities) when the child is wearing safety gear or is perceived to be in a safer environment.²⁵

A systematic review was done to identify successful interventions that attempted to modify the home environment specifically for fall risks.²⁶ The most common countermeasure tested was the provision of stair gates, but others practices included the use or possession of a baby walker, use of window locks or guards, and the use of non-slip mats or decals in the bathtub. The researchers reported that the provision of free or subsidized stair gates was effective in increasing their use, and that there was some evidence that the interventions were effective in reducing baby walker use. However, reductions in fall rates were not observed due to limitations with these studies, including small sample sizes and relatively short follow-up periods.

Research Gaps

On a global level, non-fatal fall injury statistics are limited. Only 10% of the world's children live in high-income countries yet most of the published literature describing the epidemiology of fall-related injuries in children is drawn from this area. Global statistics on non-fatal fall injuries have been identified as a need in the field.⁴ The prevalence and incidence of fall-related injuries, risk factors, and prevention strategies from low- and middle-income countries is still in a nascent stage. Challenges persist related to accurate

and complete reporting and therefore hamper the field's ability to consider the most effective prevention strategies.

Intervention trials focusing on preventing falls in children have been conducted primarily in developed countries. Given the importance of the physical environment as a risk factor for falls, more research is needed to understand the unique risk factors and concomitant prevention strategies for developing countries. Similarly, additional work is needed to evaluate the impact of regulations and policies to develop and maintain safe playgrounds across the range of settings where children engage with such play equipment. One U.S. study that focused only on child care settings found that many state regulations for safe playground equipment do not comply with published national health and safety standards.²⁷ Studies are needed to better understand how to ensure compliance with national standards and to determine the impact and appropriateness of such standards.

Conclusions

Despite the continuing issues of quality data, falls contribute significantly to the global burden of injury. In order to better direct limited resources, a more accurate and complete reporting of falls is needed. Effective strategies exist for primary prevention of certain types of falls, and these need to be more widely and effectively disseminated to both parents and providers to promote their widespread adoption. However, additional research is needed to identify the best combination of approaches (educational, engineering, environmental, enforcement) to address the multiple injury risks related to falls across the childhood years. Translation research is needed to better identify and understand the key implementation issues related to success so that lessons learned in one country can strategically guide others.

Implications for Parents, Services and Policy

Effective fall prevention requires a coordinated and comprehensive approach that considers the changing developmental capabilities of children within the context of an environment built primarily for adults. Parents and caregivers of infants need to be educated about the falls risks of infants and young children and how to prevent them. Delivering such education, along with free or low cost products through the health care system would ensure reaching a large proportion of the population, at least in developed countries. Pediatricians can provide effective anticipatory guidance as well as lend support to additional efforts both in the health care setting and in the community. Day care providers, school administrators, housing authority administrators and policy makers should be encouraged to comply with all relevant safety standards for creating safe environments for the children in their care.

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