Child Window Falls White Paper

by Don Porth and Jan Berichon (rev. 6/25/18)

Problem Summary

Home window falls for children age 5 and under is a significant and under-reported problem across the United States. Safe Kids Worldwide (1) reports that an average of eight children ages 5 and under die and 3,300 others suffer severe injury each year. Prevention professionals believe this is vastly underreported because these statistics are drawn from a past study that only included emergency room admissions. Not all children who fall from windows are admitted to the emergency room, hospital, or get entered into a trauma injury tracking system. Some cases are not included if they were not specifically coded (in a hospital coding system) as a fall from a window.

Until October 2015, the ICD-9 (International Classification of Diseases - 9th Edition) Code E882 was used to code a window fall as "Fall from Building" making tracking the true number of child window falls more difficult. The specific part of the building a child fell from may not have been indicated, causing a window fall to be excluded from studies. On October 1, 2015, medical coding changed allowing for more consistent coding convention for window falls. The coding used in ICD-10 is now code W13, with subcategories of W13.4, which indicates a fall from, out of, or through a window. This change has allowed for more accurate coding and tracking.

This paper discusses the factors that lead to window falls and the solutions that are available to prevent them. These factors and solutions demonstrate that the majority of child window falls are *predictable*, therefore *preventable*.

Background

On March 22, 2011, four year old Evan was playing with his brother in the upstairs bedroom of their rented home in Hawaii. The family had moved to Hawaii from the mainland. As is often the case, parents may not recognize the dangers of an upper floor window. Additionally, renters may not feel comfortable or empowered to affix window safety devices to a rental property. The climate and views contributed to a home environment conducive to opening windows to allow fresh air to enter the home (in many parts of the United States, this is a seasonal occurrence). Evan unlocked the window, climbed onto the window sill, lost his balance, and fell fourteen feet to the concrete below. He died of a traumatic head injury.

Sadly, Evan's death, and the sequence of events leading to it, are not uncommon nor unpredictable. Each year in the United States, eight children aged 5 and under will be reported to die from window falls. Thousands of other young children will suffer injury, life-long physical disability, and mental anguish. Making windows safer, and interrupting the sequence of events that lead to window falls, can prevent needless death, injury, and suffering.

Factors Leading To Child Window Falls - The Consumer Product Safety Commission (CPSC) issued a special study indicating children are at risk of death and serious injury from falls through open windows. Children age 5 and younger account for a higher percentage of window fall fatalities and injuries than any other age group. The CPSC went on to recommend that windows be opened less than 4 inches to prevent

child window falls (the same dimension used to prevent children's heads from passing between stair balusters, deck, and balcony railings). A requirement that window screens include a label warning of fall dangers was also required at some point. However, most screen installations are such that the warning label is obscured or hidden due to the placement of the label and design of the window, rendering the warning useless.

Awareness of this problem, and subsequent engineered solutions, began to migrate into codes related to housing. In 2003, the International Residential Code (IRC) (3) stated in "Section 310 - Emergency Escape and Rescue Openings," the need to have both escape and rescue functions maintained in sleeping rooms of residential living units. The 2006 IRC (4) would add the language related to escape to say openings shall be operational from inside the room without use of keys, tools, or special knowledge. In "Section 613," the IRC describes the size and construction of Exterior Doors and Windows to include the height above the floor on the inside, and height above grade on the outside as factors for safety. It also makes the first reference to window guards, and the need for any window guards to be compliant with ASTM Standard F2090. IRC 2009 (5) expands further on window design and prevention methods and continues to reference ASTM F2090 for details on window guards and window safety devices.

ASTM Standard F2090 (6) addresses the following key topics (and many others):

- Window Fall Prevention Screens and Fall Prevention Window Guard Devices
- Window Opening Control Devices
- Window Fall Prevention Screens, Fall Prevention Window Guards, and Factory Applied/installed Window Opening Control Devices
- Window Opening Control Devices Designed for Aftermarket Applications
- Performance Testing (of devices)

The ASTM Standard F2090 provides guidelines for each method of window fall prevention and is intended to provide the needed support to the IRC to help create safe windows in residential housing.

It is important to note that the creation of ASTM Standard F2090 was driven by the CPSC study and recommendation that identifies children aged 5 and under as the most at-risk children for window falls.

In relation to fire and life safety and the emergency escape expectations within the standard, children aged 5 and under cannot be expected to self-escape from an upper floor window in the event of a fire. The national fire service operates under the expectation and operational reality that children of that age would require a search and rescue operation at a fire event.

Why Are These Children At Increased Risk for Window Falls? - Children age 5 and under have small bodies and large heads. Because of this, a situation where their head can exert leverage over their body can contribute to a fall. If they are looking out a window in an elevated position or climbing on a piece of furniture near a window, the child can lose their balance and fall in a way from which they cannot recover.

Young children are also at a point of physical development where their strength and dexterity are such that they can be protected by devices that combine strength and dexterity to operate. Examples are child

resistant medication containers or child resistant lighters. It should be noted that *any* child-resistant device is only child-resistant, not child-proof.

Young children also lack the intellectual development to understand cause and effect. In other words, telling them that climbing on furniture near a window or leaning against a screen will lead to a fall, that may lead to injury or death, are not effective arguments to discourage their behavior. They simply cannot link together the kind of thinking that moves from one outcome to the next, to the next.

These factors indicate that engineered solutions may provide the most effective strategies to prevent child window falls.

Are Young Children Capable of Emergency Escape (Self-Evacuation)? - It is important to understand the limitations of young children (age 5 and under). If a young child without the understanding of cause and effect and lacking the strength to perform escape actions were to attempt an emergency escape from an upper level window (such as during a fire in the home), it is quite likely they would fall and suffer injury or death in an escape attempt. The National Fire Protection Association (NFPA), an identified leader in fire data reporting, does not offer any findings related to windows with child fall prevention devices causing interference with emergency escape (by either adults or children) or related to hindered emergency access by responding firefighters.

As always, the safety of young children, especially in the event of a fire, is largely in the hands of the supervising adult. An understanding of this fundamental concept should explain why children protected by window safety devices are not at increased risk for entrapment during a fire.

With these regulatory elements in place, and evidence that child home window falls needlessly take lives and cause injury each year, solutions can be formulated. Yet to date, consistent prevention strategies and understanding by property owners and managers and emergency responders is limited. By understanding the background issues leading to child window falls, and the code development that is intended to facilitate solutions, housing of any type should be able to be equipped with the appropriate safety measures to protect young children from injuries and death related to window falls.

Solutions

Is it possible to balance child safety with a window designed to provide emergency escape AND access by firefighters? It is. And the necessary safety aspects can be built into a window, added to a newly built window, or retrofitted to an existing window.

Two key issues face the effort to abate child window falls. The first, and probably most urgent, is how to retrofit existing windows to provide for safe housing that is already constructed. The second, and probably easier issue is how to amend the codes to ensure all future housing is constructed with features designed to reduce child window falls.

Existing Housing Solutions - ASTM Standard F2090 provides a good starting point for devices designed to retrofit existing windows. There are three basic approaches distinguished in ASTM F2090 and each take into account the emergency escape considerations indicating “No special knowledge or tools are required to remove the device for emergency exit”.

- *Window Opening Control Devices* - For a Window Opening Control Device to meet the ASTM F2090 standard, it must be applied in a way that limits the window opening to less than 4 inches, needs two motions to open it (such as holding it open against a spring while simultaneously moving the window past it), and it must automatically reset when the window is closed. Window Opening Control Devices should not be confused with window opening limiters (devices such as those that clamp onto the track, wedge the window, or block the track like window sticks) that do not carry the "two motion" characteristic necessary to make it a Window Opening Control Device. These might be sold as "window security" devices, but they may not qualify as a Window Opening Control Device.
- *Window Guards* - Window Guards classified as fall prevention devices are found inside the window. They consist of horizontal or vertical bars (sometimes netting in place of bars) which are inserted into holding bars that are screwed into the inside window frame. The guards are released by depressing two separate, spring-loaded pins and collapsing the telescoping tubes into themselves, thus reducing the size of the guard so it can be removed from the holding bars. ASTM F2090 specifies the force a Window Guard must withstand and also specifies the spacing between bars that limit any opening in the window to less than 4 inches.
- *Safety Screens* - Safety Screens are a specialized screen device that can retrofit to an existing window. "Normal" window screens have a basic function of keeping insects out when the window is open. A normal screen has a nylon or light metal mesh held into an aluminum frame by wedging the screen fabric into a groove with a rubber cord inserted into the same groove, thus holding the screen material in place. Safety Screens are of a more robust design and can provide a level of strength that can meet ASTM safety standards while serving as an aesthetically appealing screen that also keeps out insects. It uses a steel mesh clamped into a welded steel frame to create a much more rigid assembly. These screens are known to have a longer life and increased durability, thus reducing costs over time.

Future Housing Yet-To-Be Built - When homes are built from scratch, codes can be amended to require windows to be manufactured with window safety devices engineered into the finished window assembly. These "assemblies" would not only be engineered and certified as a unit, but they would likely be more cost effective to produce. Manufacturers are available that build window assemblies that incorporate window safety devices into them.

Other ways to enhance window safety would be to amend codes to include construction criteria requiring at-risk windows to be further above floor level to limit child access, and consider fall distance outside the window. These factors could determine the requirement of safety measures on windows.

Reports About Child Window Falls

Comprehensive studies are few regarding child window falls. Below are the most comprehensive reports available relevant to child window falls.

- *"Pediatric Injuries Attributable to Falls From Windows in the United States in 1990-2008" (2) (*PEDIATRICS Volume 128, Number 3, September 2011) - This report provides the foundation for most research-based discussion related to child window falls. It utilized the National Electronic Injury Surveillance System (NEISS) to review an estimated 98,415 child window fall

cases over a 19 year study period with samples from across the United States. The findings include:

- During the study period, an average of 5,180 children were treated for window falls each year.
- 1/4th of the children required admission to the hospital as a result of their fall.
- The mean age of the children studied was 5.1 years of age.
- Children age 0-4 were more likely to sustain head injuries.
- 0.2% of the cases were fatal.
- In 72.7% of the cases, the height of the fall was documented (30.8% one story; 62.7% two story; 6.5% three story).
- While only 16.5% of the cases provided information about the status of the window, 82.8% of the cases with information reported a screen was in place (and failed to provide any protection) at the time of the fall.

- *Safe Kids Worldwide - "Report to the Nation: Protecting Children In Your Home" February 2015 (1)* - Safe Kids Worldwide reports that an average of eight children ages 5 and under die and 3,300 others suffer severe injury each year. They further surveyed caregivers and found that 77% had never used, or were unsure if they had used, window guards or safety devices.
- *American Academy of Pediatrics - Falls From Heights: Windows, Roofs, and Balconies (Pediatrics Vol. 107 No. 5 May 2001)(7)* - This article discusses falls in a broad sense, but emphasizes falls from heights, especially from windows because of the significant representation it carries in child falls. The following points are brought out in the article:
  - After motor vehicle injuries, falls of all kinds are the second leading cause of death from unintentional injury in the United States, accounting for more than 13,000 deaths during 1998 among persons of all ages, 126 of which were children age 14 years and younger.
  - Fatalities occur primarily when children fall from great heights (greater than 2 stories or 6.7 meters/22 feet), or when the head of a child hits a hard surface, such as concrete.
  - ...the average age of patients injured in falls from heights is approximately 5 years....
  - Data from the CPSC on the approximately 4,700 children who were examined in emergency departments because of falls from windows during 1993 indicate that 90% fall from the first and second stories and that 45% had injuries defined by the CPSC as "serious," such as fractures, internal injuries, concussions, intracranial hematomas, and intracranial hemorrhages. Of those injured, 28% were admitted to the hospital compared with 4% for all consumer product related injuries reported to the CPSC during 1993.
    - *Relative to this point, it should be noted that most of the injuries described above would likely trigger a child being registered in the "trauma system." This places them in a tracked and quantifiable category in the health and human services agencies of most states. If a child is not injured seriously or is treated outside of the emergency room, perhaps at an emergency care clinic or primary care doctor, they will not be recognized as a statistic in the trauma system data. Because of this variable, many child window falls are never recognized in statistical reporting.*
  - The installation of window guards is a prove preventative strategy. In 1976, the New York City Board of Health, noting that window falls accounted for 12% of the deaths from unintentional injury of children younger than 15 years, lobbied the city council to pass a

law requiring the owners of multiple story dwellings to provide window guards in apartments where children 10 years and younger reside. This law was passed after the implementation of a pilot program combining education with the provision of free window guards. The pilot program resulted in a 35% reduction in deaths attributable to falls from windows and a 50% reduction in incidents; no child fell from a window equipped with a window guard (during that period). The mandatory program resulted in a reduction of up to 96% in admission to local hospitals for the treatment of window-fall related injuries.

  - Recent data on the New York City experience showed no increase in the number of deaths attributable to residential fires (in fact, there was a decrease) after the introduction of window guards as required by the city ordinance.

- *NFPA - "Characteristics of Home Fire Victims" - Marty Ahrens October 2015 (8)*
  - NFPA reports nothing relevant to fire deaths attributed to the inability to escape a bedroom through the window or any other means.
  - NFPA reports that in 1980, youth under age 5 represented approximately 18% of all fire deaths. By 2011, youth under age 5 represented 6% of all fire deaths. This reduction made a particularly notable drop beginning in July 1994 when CPSC requirements for child-resistant lighters was implemented. Death rates for youth under age 5 in 1994 were approximately 20% of all fire deaths. Since child-resistant lighters utilized the same behavioral science to make lighters safer that is being recommended for at-risk windows, the same type of change might be expected.
- *International Fire Service Training Association (IFSTA) ResourceOne (9)* - IFSTA was established in 1934. The mission of IFSTA is to identify areas of need for training materials and foster the development and validation of training materials for the fire service and related areas. IFSTA is an association of fire service personnel who are dedicated to upgrading fire fighting techniques and safety through training in cooperation with Oklahoma State University and in partnership with the International Fire Service Training Association. ResourceOne provides a one-stop, online location for all IFSTA curriculum and learning resources. ResourceOne provides a training module called "Essentials of Community Risk Reduction." Within this module is a section on Fall Prevention, which includes four sections:
  - Furniture Falling on Children
  - Falls From Windows
  - Falls From Shopping Carts
  - Falls on Playgrounds

  In the section on Falls From Windows, the following topics and facts are conveyed to students:

  - 5,100 children younger than age 18 are treated in emergency rooms each year for window falls
  - 3,300 children age 5 and under are treated in emergency rooms each year for window falls
  - 34% of these young children will be hospitalized
  - Approximately 8 of these children will die
  - Window falls cause more serious injuries than any other type of fall
  - Window screens are not enough to keep children safe
  - Death can occur when children press against screens or climb on furniture near windows

- Prevention tips include:
    - Open windows from the top whenever possible
    - Keep furniture away from windows
    - Install window guards and stops to prevent children from falling

Conclusion

Documentation of injuries and deaths related to child window falls clearly show evidence of a problem. Mechanisms designed to safeguard windows from child falls are available in many different forms, each suited to work with the wide variety of window types and applications. This makes a unified approach to standardized and complete protection of windows in all new and existing construction an achievable goal. If well thought out, a plan can be put in place to bring the problem of child window falls to an end. If a problem is *predictable*, it is also *preventable*.

Sources

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