Lehigh Valley Health Network
LVHN Scholarly Works

Department of Pediatrics

Falls From Homes, It's Not Just a Window Problem

Julia Vandenheuvel MD
Lehigh Valley Health Network, julia.vandenheuvel@lvhn.org

Michele Dunstan
Lehigh Valley Health Network, Michele.Dunstan@lvhn.org

Kyle Shaak BS
Lehigh Valley Health Network, Kyle.Shaak@lvhn.org

Sarah A. Jones Sapienza MD
Lehigh Valley Health Network, Sarah.JonesSapienza@lvhn.org

Debra Esernio-Jenssen MD
Lehigh Valley Health Network, debra.esernio-jenssen@lvhn.org

Follow this and additional works at: https://scholarlyworks.lvhn.org/pediatrics

Part of the Pediatrics Commons

Let us know how access to this document benefits you

Published In/Presented At

Vandenheuvel, J., Dunstan, M., Shaak, K., Jones Sapienza, S., & Esernio-Jenssen, D. (2022). *Falls from homes, it's not just a window problem*. Poster presented at Lehigh Valley Health Network, Allentown, PA.

This Poster is brought to you for free and open access by LVHN Scholarly Works. It has been accepted for inclusion in LVHN Scholarly Works by an authorized administrator. For more information, please contact LibraryServices@lvhn.org.

Falls From Homes, It's Not Just a Window Problem

Julia Vandenheuvel, MD,[1] Michele Dunstan, MSN, RN, CCRN,[2] Kyle Shaak, MPH,[3] Sarah Jones Sapienza, MD,[4] Debra Esernio-Jenssen, MD[5]

[1]Department of Pediatrics, Pediatric Resident, [4]Division of Pediatric Surgical Services and Medical Director Pediatric Trauma Services, [5]Chief Section of Child Protection Medicine, Lehigh Valley Reilly Children's Hospital, Allentown, PA
[2]Trauma Program Developmental Office, Pediatric Trauma Program Manager, [3]Network Office of Research and Innovation (NORI), Biostatistician, Lehigh Valley Health Network, Allentown, PA

Introduction

- Falls are the leading cause of unintentional injury for children in the United States.
- According to the CDC in 2017, unintentional falls were the leading cause of non-fatal emergency department visits for children 18 years and younger.
- It has been estimated that three million children require emergency department care for fall-related injuries.
- More recent studies have found that falls occur around the nation in both urban and suburban areas.
- Preschool-aged children have highest risk of falling with predisposition to males over females, window falls, and seasonal trend favoring warmer months.
- Studies have demonstrated that window screens are often in place but do not provide adequate protection against window falls.
- Allentown, the third largest city in Pennsylvania, does not have legislation mandating window guards in either urban or suburban settings.
- Lehigh Valley Reilly Children's Hospital is a Level II Pediatric Trauma Center, in which many children are referred and treated for injuries secondary to falls from homes.
- Injury prevention for all children who sustain a fall from a home should be addressed nationally.

Objectives

- To evaluate demographics, seasonal trends, type of residence, status of window, and severity of injury in relation to the height of fall and landing surface.

Methods

DESIGN

- Retrospective chart review of 47 eligible pediatric patients who fell from a building, window, roof, balcony, or other structure between January 1, 2015 and October 31, 2020.
  - Exclusion criteria included any patient >15 years of age as per the definition of a pediatric trauma patient.
    - Falls were excluded if related to structural damage, small height from a deck or furniture such as highchair, and/or external structures like a treehouse.
- Data was collected via the Trauma Registry and electronic medical record.
- The Pennsylvania Trauma Systems Foundation 2020 operational manual was utilized.

Results

Of the 47 patients, 31 (66%) patients were male (table 1), and summer was the predominant month (47%) of falls. The most common falls were from windows (94%) without window guards present (100%). Single family homes (49%) were the most predominant dwelling. Active children (5 to 9 years) were more likely to fall from greater heights (P=.047) as compared to young children (0-4 years) (table 2). A significant association in the patients' Injury Severity Score (ISS) when compared to height of the fall was found (P=.002). Patients who fell from heights >30 feet experienced severe and very severe ISS at a higher-than-expected frequency compared to patients falling from lower heights (table 2). The association between landing surface and ISS was found to be significant (P=0.018). All falls that resulted in severe or very severe ISS landed onto cement, while 76% of non-cement falls resulted in minor ISS (table 3). Four patients who fell from heights of >30 feet sustained significant head trauma (100%) and/or internal organ injury (75%) (table 4). Two deaths occurred. Despite 39 patients (83%) falling from heights >10 feet, many did not sustain significant injuries. Intensive care unit (ICU) rates (28%) were lower as compared to the pediatric unit (57%). Although the association between ISS and the presence of furniture near a window was found to be non-significant (P=.272), it is worth noting that all cases (n=5) where no furniture was near the window the fall resulted in a minor ISS (table 5). However, the presence of furniture data point was missing in nearly 40% of window falls.

TABLE 1. DEMOGRAPHICS OF PEDIATRIC PATIENTS

	PATIENTS
Age median (IQR)a	3.0±3
Gender n(%)	
Female	16 (34.0)
Male	31 (66.0)
Race n(%)	
White or Caucasian	28 (59.6)
Black or African American	10 (21.3)
Other	7 (14.9)
Unknown	2 (4.3)
Ethnicity n(%)	
Not Hispanic or Latino	34 (72.3)
Hispanic or Latino	12 (25.5)
Unknown	1 (2.1)
Comorbidities at Time of Injury n(%)	
Yes	9 (19.1)
No	38 (80.9)
History of Previous Neurological Disorderb n(%)	
Yes	8 (17.0)
No	39 (83.0)

Median and Interquartile Range (IQR) is reported in place of mean due to significant skew in the data. Neurological disorders include seizure, developmental delay, and hyperactivity.

TABLE 2: COMPARISONS OF HEIGHT OF FALL BY VARIOUS CHARACTERISTICS

CHARACTERISTIC	SAMPLE	2-10 FEET FALL	11-20 FEET FALL	21-30 FEET FALL	>30 FEET FALL	FISHER'S EXACT TEST
Age Group						
0-4	28 (59.6)	8 (100.0)	16 (59.3)	3 (37.5)	1 (25.0)	p=.047
5-9	17 (36.2)	0 (0.0)	10 (37.0)	4 (50.0)	3 (75.0)	
10-14	2(4.3)	0 (0.0)	1 (3.7)	1 (12.5)	0 (0.0)	
Seasonality of Fall						
Fall	4 (8.5)	2 (25.0)	2 (7.4)	0 (0.0)	0 (0.0)	p=.499
Winter	2 (4.3)	0 (0.0)	1 (3.7)	0 (0.0)	1 (25.0)	
Spring	19 (40.4)	4 (50.0)	10 (37.0)	4 (50.0)	1 (25.0)	
Summer	22 (46.8)	2 (25.0)	14 (51.9)	4 (50.0)	2 (50.0)	
Injury Severity Score						
0-8 (minor)	30 (63.8)	3 (37.5)	22 (81.5)	4 (50.0)	1 (25.0)	p=.002
9-15 (moderate)	10 (21.3)	4 (50.0)	2 (7.4)	4 (50.0)	0 (0.0)	
16-24 (severe)	3 (6.4)	1 (12.5)	1 (3.7)	0 (0.0)	1 (25.0)	
25+ (very severe)	4 (8.5)	0 (0.0)	2 (7.4)	0 (0.0)	2 (50.0)	
Race						
White	28 (59.6)	5 (62.5)	17 (63.0)	6 (75.0)	0 (0.0)	p=.068
Black	10 (21.3)	2 (25.0)	6 (22.2)	0 (0.0)	2 (50.0)	
Other	7 (14.9)	0 (0.0)	3 (11.1)	2 (25.0)	2 (50.0)	
Unknown	2 (4.3)	1 (12.5)	1 (3.7)	0 (0.0)	0 (0.0)	
Ethnicity						
Hispanic or Latino	12 (25.5)	3 (37.5)	4 (14.8)	3 (37.5)	2 (50.0)	p=.096
Not Hispanic or Latino	34 (72.3)	4 (50.0)	23 (85.2)	5 (62.5)	2 (50.0)	
Unknown	1 (2.1)	1 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)	
Admission GCS						
Mild (13-15)	41 (87.2)	8 (100.0)	23 (85.2)	8 (100.0)	2 (50.0)	p=.174
Moderate (9-12)	1 (2.1)	0 (0.0)	1 (3.7)	0 (0.0)	0 (0.0)	
Severe (3-8)	5 (10.6)	0 (0.0)	3 (11.1)	0 (0.0)	2 (50.0)	
Disposition from ED						
ICU/Critical Care Unit	13 (27.7)	3 (37.5)	6 (22.2)	2 (25.0)	2 (50.0)	P=.088
Step down unit/ intermediate	3 (6.4)	0 (0.0)	3 (11.1)	0 (0.0)	0 (0.0)	
Morgue	2 (4.3)	0 (0.0)	0 (0.0)	0 (0.0)	2 (50.0)	
Home	2 (4.3)	0 (0.0)	2 (7.4)	0 (0.0)	0 (0.0)	
Pediatric Unit	27 (57.4)	5 (62.5)	16 (59.3)	6 (75.0)	0 (0.0)	

TABLE 3: COMPARISONS OF LANDING SURFACE BY VARIOUS CHARACTERISTICS

Characteristic	Sample	Cement	Other Surface	Fisher's Exact Test
Age Group				
0-4	28 (59.6)	14 (63.6)	14 (56.0)	p=.877
5-9	17 (36.2)	7 (31.8)	10 (40.0)	
10-14	2 (4.3)	1 (4.5)	1 (4.0)	
Seasonality of Fall				
Fall	4 (8.5)	3 (13.6)	1 (4.0)	p=.318
Winter	2 (4.3)	2 (9.1)	0 (0.0)	
Spring	19 (40.4)	8 (36.4)	11 (44.0)	
Summer	22 (46.8)	9 (40.9)	13 (52.0)	
Injury Severity Score				
0-8 (minor)	30 (63.8)	11 (50.0)	19 (76.0)	p=.018
9-15 (moderate)	10 (21.3)	4 (18.2)	6 (24.0)	
16-24 (severe)	3 (6.4)	3 (13.6)	0 (0.0)	
25+ (very severe)	4 (8.5)	4 (18.2)	0 (0.0)	

TABLE 4: TYPES OF INJURIES SUSTAINED BY HEIGHT OF FALL*

	2-10 Feet n=8	11-20 Feet n=27	21-30 Feet n=8	>30 Feet n=4	All Falls N=47
Type of Injury n (%)					
Head Trauma w/ Skull Fracture	4 (50.0)	5 (18.5)	0 (0.0)	2 (50.0)	11 (23.4)
Head Trauma w/o Skull Fracture	0 (0.0)	7 (25.9)	5 (62.5)	2 (50.0)	14 (29.8)
Internal Organ Injury	1 (12.5)	0 (0.0)	3 (37.5)	3 (75.0)	7 (14.9)
Cutaneous Injury	7 (87.5)	23 (85.2)	6 (75.0)	4 (100)	40 (85.1)
Other Fracture	4 (50.0)	9 (33.3)	6 (75.0)	4 (100)	23 (48.9)

*Column Percentages total greater than 100% because a single fall could result in multiple types of injuries.

TABLE 5: COMPARISONS OF PRESENCE OF FURNITURE NEAR WINDOW BY VARIOUS CHARACTERISTICS

Characteristic	Sample*	Furniture Near Window	No Furniture Near Window	Fisher's Exact Test
Age Group				
0-4	15 (55.6)	12 (54.5)	3 (60.0)	p=1.00
5-9	12 (44.4)	10 (45.5)	2 (40.0)	
Seasonality of Fall				
Fall	4 (14.8)	3 (13.6)	1 (20.0)	p=1.00
Winter	1 (3.7)	1 (4.5)	0 (0.0)	
Spring	10 (37.0)	8 (36.4)	2 (40.0)	
Summer	12 (44.4)	10 (45.5)	2 (40.0)	
Injury Severity Score				
0-8 (minor)	15 (55.6)	10 (45.5)	5 (100)	p=.272
9-15 (moderate)	6 (22.2)	6 (27.3)	0 (0.0)	
16-24 (severe)	2 (7.4)	2 (9.1)	0 (0.0)	
25+ (very severe)	4 (14.8)	4 (18.2)	0 (0.0)	

*Records were excluded from analysis if the fall was not from a window or if the status of furniture near the window was unknown.

Conclusions

- Our findings were comparable to literature regarding male predominance and seasonality trends related to falls.
- Children who fell greater distances onto a harder surface such as cement sustained more severe injuries.
- At Lehigh Valley Reilly Children's Hospital, patients who sustain a fall >10 feet trigger a pediatric level two trauma notification that provides a rapid response by a multidisciplinary team.
- Providing care to a traumatically injured patient with the intent of reducing injury-related disability and/or death remains a public health priority.
- Accessible healthcare-related systems ranging from pre-hospital and acute care to rehabilitation services remains an important strategy to injuries when prevention fails.
- Trauma registries remain important for care performance processes serving as repositories for data evaluating outcomes measures and quality improvement.
- Injury prevention is imperative, especially in active children (5-9 years), to prevent future, irreversible consequences related to falls from homes.

REFERENCES

1. American Academy of Pediatrics, Committee on Injury and Poison Prevention. Falls from heights: window, roofs, and balconies. *Pediatrics*. 2001; 107 (5): 1188-1191
2. Center for Disease Control and Prevention and U.S. Department of Housing and Urban Development. *Healthy housing reference manual*. Atlanta, GA: US Department of Health and Human Services; 2006.
3. Chadwick D, et al. Deaths from Falls in Children: How Far is Fatal? *The Journal of Trauma*. 1991; 31 (10): 1353-1355
4. Fall Prevention. Center for Disease Control and Prevention. https://www.cdc.gov/safechild/falls/index.html. Updated February 2019. Accessed on February 9, 2020 5. Harris V, Rochette L, Smith G. Pediatric Injuries Attributable to Falls From Windows in the United States in 1990-2008. Pediatrics. 2011; 128 (30): 455-462
5. Harris V, Rochette L, Smith G. Pediatric Injuries Attributable to Falls From Windows in the United States in 1990-2008. *Pediatrics*. 2011; 128 (30): 455-462
6. Istre GR, et al. Childhood injuries due to falls from apartment balconies and windows. *Injury Prevention*. 2003; 9: 349-352
7. New Jersey Apartment Association Home to New Jersey. *NJAA Guidance on Child Protective Window Guards*. New Jersey: Department of Community Affairs; 2017
8. Pressley JC, Barlow B. Child and adolescent injury as a result of falls from buildings and structures. *Injury Prevention*. 2005; 11: 267-273
9. Toprani A, et al. New York City's window guard policy: four decades of success. Injury Prevention. 2018; 24: 114-118
10. Williams RA. Injuries in Infants and Small Children Resulting from Witnessed and Corroborated Free Falls. *The Journal of Trauma*. 1991; 31 (10): 1350-1352

© 2022 Lehigh Valley Health Network

LVHN.org

Lehigh Valley Reilly Children's Hospital