

High-rise syndrome in cats

Author : James Oxley, Tamara Montrose

Categories : [Companion animal](#), [Vets](#)

Date : October 24, 2016

ABSTRACT

High-rise syndrome (HRS) is a term used to describe cats that fall from two storeys (equivalent to 7m or 23ft) or higher, resulting in injury or, less commonly, death. A number of case series and studies have been published, thus this paper aims to review the current research relating to HRS. These studies, generally, were consistent in their findings, in that survival rate is normally above 90%, the average age of the cat tends to be between one and three years, HRS is not displayed predominantly in either sex, and the most common injuries from HRS are limb fractures, facial injuries, pulmonary contusions and pneumothorax.

Overall, HRS is preventable; however, research is needed to further understand the causes and incidence rate of this problem, which, in turn, may help identify risk factors and prevention strategies.

High-rise syndrome (HRS), originally described by Robinson¹, is a term used to refer to cats that fall from two storeys (equivalent to 7m or 23ft) or higher resulting in injury or, less commonly, death².

Table 1. A review of research and case studies investigating high-rise syndrome in cats

Source	Country	No of cases	Average majority height	Gender	Average age	Survival rate	Most common injuries
Whitney and Mehlhaff ⁶	US	152	5.5 storeys	48% male, 46% female	21 months (2.7 years)	90%	Pulmonary contusions (46%), pneumothorax (57%), facial trauma (57%), limb fractures (39%)
Dupe et al ⁷	France	413	-	-	20.4 months (2.5 years)	88% (euthanasia excluded in figures)	Limb fractures (52.3%), pulmonary contusions (51.1%), pneumothorax (26.8%)
Papazoglou et al ⁸	Greece	207	3.7 storeys	52% male, 47% female	14 months (1.2 years)	93%	Limb fractures (50%), spinal trauma (15%)
Collad et al ⁹	France	43	2nd story or higher	76% males	30 months (2.5 years)	97%	Limb fractures (42.3%), pulmonary contusions (41.7%), pneumothorax (38.9%)
Vnuk et al ⁵	Croatia	119	4 storeys (range: 2nd-10th)	42% male, 53.8% female	20 months (1.8 years)	96.5% (115/119)	Limb fractures (64.2%), thoracic trauma (33.6%), pneumothorax (20%)
Besser et al ¹⁰ (specific)	US	85	2-65 storeys		37 months (3.1 years)	94% (88.8% euthanasia excluded)	Cranial only (such as head palate fractures)
Merli et al ¹¹	Israel	107	3 to 8 storeys (range 1 to 7x)	57% male, 48% female	35 months (2.9 years)	83% (83.7% euthanasia excluded)	Orthopaedic injuries (48%), respiratory injuries (46%), facial injuries (37%)
Zimmerman et al ¹² (specific)	Austria	34	3.3 storeys	50% male, 50% female	33.9 months (2.8 years)	3 cats euthanised	Specific criteria (traumatic pancreatitis)
Lehmann et al ¹³ (specific)	Austria	4	5th, 6th, 7th, 10th storey	4 males	4 months, 3 years, 4.3 years, 13 years	2 survived, 2 died	Specific – pancreatic rupture
Cruz-Arribas and Nykamp ¹⁴ (specific)	Canada	1	6th storey	1 female	9 years	Survived	Specific – spiral cord injury
Pratschke and Kirby ¹⁴ (specific)	UK	3	2nd storey	2 male, 1 female	12 months (1.7 years) (1)	2 survived, 1 died	Thoracic and abdominal impalement

Specific: this refers to studies that only included specific case/injuries.

Table 1. A review of research and case studies investigating high-rise syndrome in cats⁶⁻¹⁴.

A variant of HRS has also been recorded in dogs, but is less frequently reported³. While the behaviour of cats is seldom reported in HRS prior to a fall, Whitney and Mehlhaff⁴ and Vnuk et al⁵ at state HRS occurs as a result of either cats playing near windows or balconies, chasing insects or birds, or slipping while near windows or balcony railings.

The authors identified a range of retrospective HRS studies and multiple or single case reports, which are reviewed in **Table 1**⁶⁻¹⁴. These studies, generally, were consistent in their findings – such that survival rate is normally above 90%, the average age of the cats tends to be between one and three years old, HRS is not displayed predominantly in either sex, and the most common injuries resulting from HRS are limb fractures, facial injuries, pulmonary contusions and pneumothorax (**Table 1**).

In addition, Pratschke and Kirby¹⁴ note additional injuries can occur if cats become impaled on fences due to falling from heights. More recently Nakladal et al¹⁵ analysed 73 cases of carpal joint injuries, of which 53 (72.6%) were caused by HRS as a result of falling out of a window – most commonly from the third or fourth floors.

The incidence of this problem remains unknown, but it is likely to be more common than reported and has been suggested to be more prevalent during warmer months in temperate climates, for obvious reasons¹⁵. Time of day has seldom been included in research⁴, but may also be an important factor to consider – particularly in conjunction with seasonal effects.

Younger cats (for example, one to three years of age) may be more susceptible to HRS due to their increased activity and play behaviour, or due to their relative inexperience with hazards, particularly in new or unfamiliar environments^{5,16}.



In one study they found cats of a younger age, and that exhibited aggressive behaviour, were more prone to falling in comparison to the control group¹⁷.

In a recent study, Passalacqua and Merola¹⁷ asked 35 owners of cats that had fallen and received veterinary treatment, and 21 owners in a control group, to complete a survey. They found cats of a younger age, and who exhibited aggressive behaviour, were more prone to falling in comparison to the control group¹⁷. As a result, although a small sample size, this suggests falls are often due to inexperience in young cats.

The finding regarding aggression, which is a frequent behavioural issue in cats^{18,19} alongside the suggested association of HRS with active and play behaviour⁵, highlights the importance of further research into, and greater consideration of, the effects of temperament and behaviour on HRS.

Breed can also impact on cat behaviour, such that some breeds – for example, Persians – are less active²⁰, while others, such as Siamese, may display breed predispositions towards aggression²¹. Use of breed, behaviour, age and experience-based assessment criteria when determining suitability of cats for adoption or rehoming would be beneficial to reduce the incidence of HRS and, therefore, enhance cat welfare.

In addition to further research into the effects of breed, behaviour and experience on HRS, other topics that are generally not noted or explored in studies of HRS include the substrate on which the cat lands – which could be an important determinant of injuries sustained – and owner-related factors. Greater consideration of how the owner's general knowledge, education and management of the cat can impact on its susceptibility to HRS would also be of value.

Conclusion

In conclusion, this brief note reviews HRS research to date and highlights areas for further research, as well as considering the application of this research in others to prevent HRS. It has been previously stated that HRS is “100% preventable”²² by following some basic advice for cat owners. This includes:

- keeping windows closed – ensure cats cannot escape from open windows or erect a window screen to ensure a cat does not escape through a window
- remove any furniture that would allow a cat to gain access to an open window
- do not allow cats on to a balcony area unsupervised – especially younger cats

By advising cat owners and potential owners on precautions that should be taken to prevent HRS, as well as factors to consider when choosing cats to reduce susceptibility to HRS (such as age, breed and temperament), veterinary centres may help reduce the incidences and injuries due to HRS seen in practice.

References

- Robinson GW (1976). The high rise trauma syndrome in cats, *Feline Pract* **6**(5): 40-43.
- Denny H and Butterworth S (2008). *A Guide to Canine and Feline Orthopaedic Surgery*, John Wiley and Sons.
- Gordon LE, Thacher C and Kapatkin A (1993). High-rise syndrome in dogs: 81 cases (1985-1991), *J Am Vet Med Assoc* **202**(1): 118-122.
- Whitney WO and Mehlhaff CJ (1987). High-rise syndrome in cats, *J Am Vet Med Assoc* **191**(11): 1,399-1,403.
- Vnuk D, Pirkić B, Maticić D, Radisić B, Stejskal M, Babić T, Kreszinger M and Lemo N (2004). Feline high-rise syndrome: 119 cases (1998-2001), *J Feline Med Surg* **6**(5): 305-312.
- Dupre G, Allenou A and Bouvy B (1995). High-rise syndrome: retrospective study on 413 cats, *Vet Surg* **24**: 294.
- Papazoglou LG, Galatos AD, Patsikas MN, Savvas I, Leontides L, Trifonidou M and Karayannopoulou M (2001). High-rise syndrome in cats: 207 cases (1988-1998), *Aust Vet Pract* **31**(3): 98-102.
- Collard F, Genevois JP, Decosnes-Junot C and Goy-Thollot I (2005). Feline high-rise syndrome: a retrospective study on 42 cases, *J Vet Emerg Crit Care* **15**(3): (suppl 1) S15-S17.
- Bonner SE, Reiter AM and Lewis JR (2012). Orofacial manifestations of high-rise syndrome in cats: a retrospective study of 84 cases, *J Vet Dent* **29**(1): 10-18.
- Merbl Y, Milgram J, Moed Y, Bibring U, Peery D, and Aroch I (2013). Epidemiological, clinical and hematological findings in feline high rise syndrome in Israel: a retrospective case-controlled study of 107 cats, *Israel J Vet Med* **68**(1): 28-37.

- Zimmermann E, Hittmair KM, Suchodolski JS, Steiner JM, Tichy A and Dupré G (2013). Serum feline-specific pancreatic lipase immunoreactivity concentrations and abdominal ultrasonographic findings in cats with trauma resulting from high-rise syndrome, *J Am Vet Med Assoc* **242**(9): 1,238-1,243.
- Liehmann LM, Dörner J, Hittmair, KM, Schwendenwein I, Reifinger M, and Dupré G (2012). Pancreatic rupture in four cats with high-rise syndrome, *J Feline Med Surg* **14**(2): 131-137.
- Cruz-Arámbulo R and Nykamp S (2012). Acute intraparenchymal spinal cord injury in a cat due to high-rise syndrome, *Can Vet J* **53**(3): 274-278.
- Pratschke KM and Kirby BM (2002). High rise syndrome with impalement in three cats, *J Small Anim Pract* **43**(6): 261-264.
- Nakladal B, vom Hagen F, Brunnberg M, Gross M, Nietz H and Brunnberg L (2013). Carpal joint injuries in cats – an epidemiological study, *Vet Comp Orthop Traumatol* **26**(5): 333-339.
- Hill FW (1977). A survey of bone fractures in the cat, *J Small Anim Pract* **18**(7): 457-463.
- Passalacqua C and Merola I (2015). High rise syndrome in cats: a clinical or a behavioural problem? *Proceedings of the AWSELVA-ECAWBM-ESVCE Congress*, Bristol.
- Heidenberger E (1997). Housing conditions and behavioural problems of indoor cats as assessed by their owners, *Appl Anim Behav Sci* **52**(3-4): 345-364.
- Landsberg GM, Hunthausen WL and Ackerman LJ (2012). *Behavior Problems of the Dog and Cat*, Elsevier Health Sciences.
- Bradshaw JW (2012). *The Behaviour of the Domestic Cat*, CABI.
- Bamberger M and Houpt KA (2006). Signalment factors, comorbidity, and trends in behavior diagnoses in cats: 736 cases (1991-2001), *J Am Vet Med Assoc* **229**(10): 1,602-1,606.
- American Society for the Prevention of Cruelty to Animals (2013). ASPCA urges pet owners to install and secure window screens to prevent “high-rise syndrome”, <http://bit.ly/1RHF0W5> (accessed 2 May 2016).