

Evidence Summary: Horseback Riding

Maciej Krolikowski, MSc Version 1 February 2018

BC INJURY research and prevention unit

The British Columbia Injury Research and Prevention Unit (BCIRPU) was established by the Ministry of Health and the Minister's Injury Prevention Advisory Committee in August 1997. BCIRPU is housed within the Evidence to Innovation research theme at BC Children's Hospital (BCCH) and supported by the Provincial Health Services Authority (PHSA) and the University of British Columbia (UBC). BCIRPU's vision is to be a leader in the production and transfer of injury prevention knowledge and the integration of evidence-based injury prevention practices into the daily lives of those at risk, those who care for them, and those with a mandate for public health and safety in British Columbia.

Author: Maciej Krolikowski

Editors: Sarah A Richmond, Amanda Black

Reproduction, in its original form, is permitted for background use for private study, education instruction and research, provided appropriate credit is given to the BC Injury Research and Prevention Unit. Citation in editorial copy, for newsprint, radio and television is permitted. The material may not be reproduced for commercial use or profit, promotion, resale, or publication in whole or in part without written permission from the BC Injury Research and Prevention Unit.

For any questions regarding this report, contact:

BC Injury Research and Prevention Unit F508 – 4480 Oak Street Vancouver, BC V6H 3V4 Email: <u>bcinjury1@cw.bc.ca</u> Phone: (604) 875-3776 Fax: (604) 875-3569 Website: <u>www.injuryresearch.bc.ca</u>

Suggested Citation:

Krolikowski M, Black A, Richmond SA, Pike I, Babul S. *Evidence Summary: Horseback Riding*. Active & Safe Central. BC Injury Research and Prevention Unit: Vancouver, BC; 2018. Available at http://activesafe.ca/.





Evidence synthesis tool

SPORT:	Horseback Riding		Target Group:		All ages	
Injury Mechanisms:	Falls are the most common injury mechanism in horseback riding (Abu-Kishk et al, 2013; Ball et al., 2007; Davidson et al., 2015; Ekberg et al., 2011; Kiss et al., 2008; McCrory & Turner, 2005; Smartt & Chalmers, 2009; Thomas et al., 2006).					
	The majority of injuries occur in the head, trunk, and upper extremities (Abu-Kishk et al., 2013; Davidson et al., 2015; Ekberg et al., 2011; Kiss et al., 2008; McCrory & Turner, 2005; Papachristos et al., 2014; Smartt & Chalmers, 2009; Thomas et al., 2006).					
	The predominant injury types are fractures, soft tissue injuries, and head injuries (Abu-Kishk et al., 2013; Balendra et al., 2007; Eckert et al., 2011; Ekberg et al., 2011; McCrory & Turner, 2005; Papachristos et al., 2014; Thomas et al., 2006).					
Incidence/Prevalence	Risk Factors	Interv	entions	Implen	nentation/Evaluation	Resources
Children Horseback riding-related injuries are reported to occur in 21% of young riders per year. Injury estimates vary between 76 000 to 100 000 injuries per year (Havlik, 2010). Fractures Fractures of the limbs account for 17.9% of injuries recorded in show jumpers, 40% of injures recorded in Swedish eventing athletes, and 42.5% of career- ending injuries in horse racing jockeys (Balendra et al., 2007; Ekberg et al., 2011; Gass et al., 2016). Two studies found that of all equine-related injuries, 25.2% - 28.3% are fractures (reported in emergency departments in the United States) (Loder, 2008;	Riding Style A full-foot riding style increased the risk of falls for jockey and track workers (IRR=2.37, 95% CI: 1.46-3.85) (Hitchens et al., 2011) Physiological Attributes of the Rider Lower anaerobic strength and aerobic fitness, as well as higher muscular strength and power were associated with greater risk of falls (Hitchens et al., 2011) Jockey Age Increased jockey fall rates have been associated with age; however, the age most at risk varies by study. An Australian study examining event racing jump jockeys noted those over 35 years of age were at a higher	Helme While riding associa reduct study i 40% of helme with so low as	the use of protective helmets has been ated with a fivefold ion in head injuries, one reports that fewer than f riders are wearing ts at the time of injury, ome finding numbers as 9% (Havlik, 2010).	Mouth The stu investig guards Twenty sample guards sports, not we not we reporte be ann worried say wh and 3.3 guard i equest Future assess guards popula	Guards ady by Gass et al., (2016) gated the use of mouth in horseback riders. three percent of the reported finding mouth unnecessary in equestrian 26.3% reported they did ar one due to other riders aring mouth guards, 16.5% ed a mouth guard would oying, 17.2% have never d about it, 13.1% cannot y they do not wear one, % claim that a mouth s not available for rian sports. work needs to be done to the effectiveness of mouth on dental injuries in this tion. (Gass et al., 2016)	Websites http://horse.on.ca/programs/sa fety/ https://www.brainline.org/artic le/equestrian-safety

Thomas et al., 2006). In 2008, it	risk of falls (Hitchens et al.,		
was reported that ankle injuries	2011). Another study reported		
account for 34.5% of fractures.	that jockeys ages 13-15 and 10-		
(Ceroni, 2007).	29 had the highest rates of injury		
	(Havlik, 2010).		
In point to point racing, most of	In hurdle racing higher lockey		
the fractures occur in the clavicle	age resulted in 1.41 higher risk		
and upper limb (72% - 74%).	of falls resulting in injury (95%		
(Balendra et al., 2007)	CI: 1.23, 1.62) (Hitchens et al.,		
Contusion (Crush	2011)		
Contusions account for 30.8%-	Hurdle Bacing		
31 4% of equine-related injuries			
reported in the United States	'License' B jockeys, larger field		
(Loder, 2008: Thomas et al.,	size, higher club level, higher		
2006) and are the most common	race grade, and older jockey age		
injury in point-to-point	were associated with injurious		
racing.(Balendra et al., 2007)	2 16 IDD = 4 27 05% CI:1.30,		
	5 27. IPR-1 62 95% CI 1 30		
Traumatic Brain Injury	2 03· IRR-1 72· 95% CI 1 47		
(TBI)/Head Injuries	2.03, IIII = 1.72, 35% CI 1.47,		
A 2015 study demonstrated that	1.62. respectively) (Hitchens et		
concussions accounted for 9.5%	al., 2011).		
of show jumping injuries (Gass et	Steenlashees Desing		
al., 2016). Of all equine-related	Steeplechase Racing		
hospitalization 18-53.9% are	For steeplechase racing, 'License		
head injuries (Abu-Kishk et al	B' jockeys, larger field size,		
2013: Papachristos et al., 2014).	longer race distance, and higher		
Further, 11.6% of equine injuries	club level were associated with		
reported to hospitals in the	Increased risk of fails (IRR=1.35,		
United States were TBIs (Loder,	95% CI.1.01, 1.81, 0.91, IKK 1.41,		
2008).	CI-1 10 1 89 IRR=1 59 95%		
	CI:1.21, 2.10) (Hitchens et al		
In eventing, the neck/head were	2011). Having had fewer		
the most common recorded	previous rides in the meeting,		
(Ekborg et al. 2011) Similarly a	lower prize money at stake was		
(EKDEIS EL dI., 2011). SIMILARIY, A	found to be protective against		

New Zealand study found that	the risk of falls (IRR=0.70, 95%			
the most frequent horse-related	CI:0.54; IRR=0.41, 95% CI:0.34,			
injury was to the head (23% of	0.50) (Hitchens et al., 2011).			
cases). (Smartt & Chalmers, 2009). In the US, 23.2% of	Multiple Day Events			
hospitalized horse-related	Two- and three- day events were			
injuries were reported as head	noted to be associated with a			
and neck injuries. (Thomas et al.,	higher risk of a horse falling			
2006)	(0.91 falls per 1000 jumping			
	efforts, 95% CI 0.69, 1.18)			
	compared to one-day events			
	(0.27 falls per 1000 jumping			
	efforts, 95% CI 0.23, 0.33)			
	(Murray et al., 2005)			
	Sex			
	Females are reported to be at a			
	higher risk of falls compared to			
	males (IRR=1.11, 95% CI:1.00-			
	1.23) (Hitchens et al., 2011).			
Works Cited	Marka Citada		Marka Citada	
WORKS CITED:			Works Cited:	
Abu-Kishk, I., Kiin, B., Gilady-	Havlik, H. S. (2010). Equestrian	Havlik, H. S. (2010). Equestrian	Gass, M., Kuni, S., Connert, T., &	
Loron, N., Jeroukinnov, I., &	sport-related injuries: A review	of our rent literature. Current	in showing A trinstional	
esnel, G. (2013). Hospitalization	Sports Madicino Bonorts O(E)	Sports Madiaina Banarta (UE)	in showjumping - A trinational	
anything changed 2 A 25 year		200, 202	Study between Switzenand,	
anything changed? A 25 year	299-302.	299–302.	Traumatology 22(2) 174 170	
Survey. Isruel Medical Association	Hitchons D. Plizzard I. Jonas		11duinatology, 32(3), 174–179.	
<i>Journal.</i> 15(4), 109–172.	C Day L & Fall L (2011)			
Balandra C. Turnar M. S.	G., Day, L., & Fell, J. (2011).			
McCrory, D. (2007) Caroor	falls in jumps racing in Australia			
anding injurios to professional	Accident Analysis and			
include in British horse racing	Dravantian A2(2) 840-847			
(1991-2005) British Journal of	Fievenuon, 43(3), 840-847.			
(1331-2003). British Journal Of Sports Medicine $A2(1)$ 22-24	Murray L K Singer F R			
Caroni D (2007) Support and	Morgan K Droudman C 9.			
safety features in preventing feat	French N. P. (2005) Pick factors			
jockeys in British horse racing (1991-2005). British Journal of Sports Medicine, 42(1), 22–24.	Prevention, 43(3), 840–847. Murray, J. K., Singer, E. R.,			
safety features in preventing foot	French, N. P. (2005). Risk factors			

and ankle injuries in equestrian	for cross-country horse falls at		
sports. International Sport	one-day events and at two-		
Medicine Journal, 8(3), 166–178.	/three-day events. Veterinary		
	Journal, 170(3), 318–324.		
Ekberg I Timpka T Bamel H			
$\frac{2}{2}$ Voltor 1 (2011) Injury rates			
& vallel, L. (2011). Injuly lates			
and risk-factors associated with			
eventing: a total cohort study of			
injury events among adult			
Swedish eventing athletes.			
International Journal of Injury			
Control and Safety Promotion,			
18(4), 261–267.			
Cass M Kübl S Connort T &			
Gass, IVI., Kulli, S., Collielt, T., &			
Filippi, A. (2016). Dental trauma			
in showjumping - A trinational			
study between Switzerland,			
France and Germany. Dental			
Traumatology, 32(3), 174–179.			
Havlik, H. S. (2010). Equestrian			
sport-related injuries: A review of			
current literature <i>Current</i> Sports			
Madicina Paparts Q(E) 200–202			
We ultime Reports, 9(3), 299-302.			
Loder, R. I. (2008). The			
demographics of equestrian-			
related injuries in the United			
States: injury patterns,			
orthopedic specific injuries, and			
avenues for injury prevention.			
The Journal of Trauma, 65(2)			
447–460			
Smartt D & Chalmars D (2000)			
A name a la at la a			
A new look at horse-related sport			
and recreational injury in New			

Zealand. Journal of Science and Medicine in Sport, 12(3), 376–		
382.		
Thomas K E Annest I I		
Gilchrist, J., & Bixby-Hammett, D.		
M. (2006). Non-fatal horse		
related injuries treated in		
emergency departments in the		
United States, 2001-2003. British		
Journal of Sports Medicine, 40(7),		
619–626.		

Review of Sport Injury Burden, Risk Factors and Prevention

Horseback Riding

Incidence and Prevalence

A review of equestrian injuries in the pediatric population reports that 21% of young riders in a year, will report a horseback riding-related injury (Havlik, 2010). Injury estimates for all horseback riding related injuries vary between 76 000 to 100 000 injuries per year (Havlik, 2010). Falls are the most common injury mechanism in horseback riding while mounted (Abu-Kishk et al, 2013; Ball et al., 2007; Davidson et al., 2015; Ekberg et al., 2011; Kiss et al., 2008; McCrory & Turner, 2005; Smartt & Chalmers, 2009; Thomas et al., 2006); while not mounted, the most common mechanism of injury is being kicked by the horse. The majority of injuries occur in the head, trunk, and upper extremities, with the predominant injury types being fractures, soft tissue injuries, and head injuries (Abu-Kishk et al., 2013; Davidson et al., 2015; Ekberg et al., 2015; Ekberg et al., 2011; Kiss et al., 2011; Kiss et al., 2008; McCrory & Turner, 2005; Papachristos et al., 2014; Smartt & Chalmers, 2009; Thomas et al., 2006).

Fractures of the limbs account for 17.9% of injuries recorded in show jumpers, 40% of injures recorded in Swedish eventing athletes, and 42.5% of career-ending injuries in horse racing jockeys (Balendra et al., 2007; Ekberg et al., 2011; Gass et al., 2016). In the United States, emergency departments report that 25.2%-28.3% of all equine-related injuries are fractures (Loder, 2008; Thomas et al., 2006). Further, it has been reported that ankle injuries account for 34.5% of all fractures (Ceroni, 2007). Contusions account for 30.8%-31.4% of equine-related injuries reported in the United States (Loder, 2008; Thomas et al., 2006), and are the most common injury in point-to-point racing (Balendra et al., 2007).

Approximately half (48-53.9%) of equine-related injuries resulting in hospitalizations are head injuries (Abu-Kishk et al., 2013; Papachristos et al., 2014). Further, 11.6% of hospitalized injuries were diagnosed as traumatic brain injuries (TBIs) (Loder, 2008). Concussions account for 9.5% of show jumping injuries (Gass et al., 2016). In eventing, the neck/head were the most common recorded injury (22.7-23% of all injuries) (Ekberg et al., 2011).

Risk and Protective Factors

Riding Style

A full-foot riding style increased the risk of falls for jockey and track workers (IRR=2.37, 95% CI: 1.46-3.85) (Hitchens et al., 2011)

Physiological Attributes of the Rider

Lower anaerobic strength and aerobic fitness, as well as higher muscular strength and power were associated with greater risk of falls (Hitchens et al., 2011)

Jockey Age

Increased jockey fall rates have been associated with age; however, the age most at risk varies by study. An Australian study examining event racing jump jockeys noted those over 35 years of age were at a higher risk of falls (Hitchens et al., 2011). Another study reported that jockeys ages 13-15 and 10-29 had the highest rates of injury (Havlik, 2010). In hurdle racing, higher jockey age resulted in 1.41 higher risk of falls resulting in injury (95% CI: 1.23, 1.62) (Hitchens et al., 2011)

Hurdle Racing

'License' B jockeys, larger field size, higher club level, higher race grade, and older jockey age were associated with injurious falls (IRR=1.68, 95% CI:1.30, 2.16; IRR=4.37, 95% CI:3.62, 5.27; IRR=1.62, 95% CI 1.30, 2.03; IRR=1.72; 95% CI 1.47, 2.02; IRR=1.41; 95% CI 1.23, 1.62, respectively) (Hitchens et al., 2011).

Steeplechase Racing

For steeplechase racing, 'License B' jockeys, larger field size, longer race distance, and higher club level were associated with increased risk of falls (IRR=1.35, 95% CI:1.01, 1.81; IRR=1.41, 95% CI:1.12, 1.77; IRR=1.44, 95% CI:1.10, 1.89; IRR=1.59; 95% CI:1.21, 2.10) (Hitchens et al., 2011). Having had fewer previous rides in the meeting, lower prize money at stake was found to be protective against risk of falls (IRR=0.70, 95% CI:0.54; IRR=0.41, 95% CI:0.34, 0.50) (Hitchens et al., 2011).

Multiple day events:

Two- and three- day events were noted to be associated with a higher risk of a horse falling (0.91 falls per 1000 jumping efforts, 95% CI 0.69, 1.18) compared to one-day events (0.27 falls per 1000 jumping efforts, 95% CI 0.23, 0.33) (Murray et al., 2005)

Sex:

Females are reported to be at a higher risk of falls compared to males (IRR=1.11, 95% CI:1.00-1.23) (Hitchens et al., 2011).

Opportunities for Prevention: Effective Interventions, Cost-Effectiveness, Implementation and Evaluation

While the use of protective riding helmets has been associated with a five-fold reduction in head injuries, one study reports that fewer than 40% of riders are wearing helmets at the time of injury, with some finding numbers as low as 9% (Havlik, 2010).

Implementation and Evaluation

While the use of protective riding helmets has been associated with a fivefold reduction in head injuries, one study reports that fewer than 40% of riders are wearing helmets at the time of injury, with some finding numbers as low as 9% (Havlik, 2010).

The study by Gass et al., (2016) investigated the use of mouth guards in horseback riders. Twenty-three percent of the sample reported finding mouth guards unnecessary in equestrian sports, 26.3% reported they did not wear one due to other riders not wearing mouth guards, 16.5% reported a mouth guard would be annoying, 17.2% have never worried about it, 13.1% cannot say why they do not wear one, and 3.3% claim that a mouth guard is not available for equestrian sports. Future work needs to be done to assess the effectiveness of mouth guards on dental injuries in this population. (Gass et al., 2016)

References

- Abu-Kishk, I., Klin, B., Gilady-Doron, N., Jeroukhimov, I., & Eshel, G. (2013). Hospitalization due to horse-related injuries: has anything changed? A 25 year survey. *Israel Medical Association Journal*, 15(4), 169–172.
- Balendra, G., Turner, M., McCrory, P., & Halley, W. (2007). Injuries in amateur horse racing (point to point racing) in Great Britain and Ireland during 1993-2006. *British Journal of Sports Medicine*, 41(3), 162–166. doi:10.1136/bjsm.2006.033894
- Ball, C. G., Ball, J. E., Kirkpatrick, A. W., & Mulloy, R. H. (2007). Equestrian injuries: incidence, injury patterns, and risk factors for 10 years of major traumatic injuries. *American Journal of Surgery*, 193(5 SPEC. ISS.), 636–640. doi:10.1016/j.amjsurg.2007.01.016
- Ceroni, D. (2007). Support and safety features in preventing foot and ankle injuries in equestrian sports. *International Sport Medicine Journal*, *8*(3), 166–178.
- Davidson, S. B., Blostein, P. A., Schrotenboer, A., Sloffer, C. A., & Vandenberg, S. L. (2015). Ten years of equine-related injuries: Severity and implications for emergency physicians. *Journal* of Emergency Medicine, 49(5), 605–612. doi:10.1016/j.jemermed.2015.03.025
- Ekberg, J., Timpka, T., Ramel, H., & Valter, L. (2011). Injury rates and risk-factors associated with eventing: a total cohort study of injury events among adult Swedish eventing athletes.
 International Journal of Injury Control and Safety Promotion, *18*(4), 261–267.
 doi:10.1080/17457300.2010.545129
- Gass, M., Kühl, S., Connert, T., & Filippi, A. (2016). Dental trauma in showjumping A trinational study between Switzerland, France and Germany. *Dental Traumatology*, 32(3), 174–179. doi:10.1111/edt.12242
- Havlik, H. S. (2010). Equestrian sport-related injuries : A review of current literature. Current Sports Medicine Reports, 9(5), 299-302. doi: 10.1249/JSR.0b013e3181f32056.
- Hitchens, P., Blizzard, L., Jones, G., Day, L., & Fell, J. (2011). Are physiological attributes of jockeys predictors of falls? A pilot study. *BMJ Open*, 1(1), e000142. doi:10.1136/bmjopen-2011-000142
- Kiss, K., Swatek, P., Lenart, I., Mayr, J., Schmidt, B., Pinter, A., & Hollwarth, M. E. (2008). Analysis of horse-related injuries in children. *Pediatric Surgery International*, 24(10), 1165–1169. doi:http://dx.doi.org/10.1007/s00383-008-2214-9
- Loder, R. T. (2008). The demographics of equestrian-related injuries in the United States: injury patterns, orthopedic specific injuries, and avenues for injury prevention. *Journal of Trauma*,

65(2), 447-460. doi:10.1097/TA.0b013e31817dac43

- McCrory, P., & Turner, M. (2005). Equestrian injuries. *Medicine and Sport Science*, 48, 8–17. doi:10.1159/000084280
- Murray, J. K., Singer, E. R., Morgan, K. L., Proudman, C. J., & French, N. P. (2005). Risk factors for cross-country horse falls at one-day events and at two-/three-day events. *Veterinary Journal*, *170*(3), 318–324. doi:10.1016/j.tvjl.2005.05.003
- Papachristos, A., Edwards, E., Dowrick, A., & Gosling, C. (2014). A description of the severity of equestrian-related injuries (ERIs) using clinical parameters and patient-reported outcomes. *Injury*, 45(9), 1484–1487. doi:10.1016/j.injury.2014.04.017
- Smartt, P., & Chalmers, D. (2009). A new look at horse-related sport and recreational injury in New Zealand. *Journal of Science and Medicine in Sport*, 12(3), 376–382. doi:10.1016/j.jsams.2008.04.001
- Thomas, K. E., Annest, J. L., Gilchrist, J., & Bixby-Hammett, D. M. (2006). Non-fatal horse related injuries treated in emergency departments in the United States, 2001-2003. *British Journal of Sports Medicine*, *40*(7), 619–626.