

Canadian Urological Association Best Practice Report: Sports and the solitary kidney — What primary caregivers of a young child with a single kidney should know (2019 update)

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Background and objectives

The American Academy of Pediatrics (AAP) provides recommendations regarding sports in the child with a solitary kidney.¹ They suggest that no restrictions be placed on non-contact sports and that clinical judgement be used regarding placing any restrictions on contact/collision and limited-contact sports.

A Canadian Urological Association (CUA) guideline on sports and the solitary kidney was initially developed in 2006, in accordance with the 2001 recommendations of the AAP,² tailoring them to the young, sports-naïve child. As per the AAP recommendations, a literature search was carried out to determine what evidence is available on the risks of injury to the pediatric kidney through sports and whether these risks might be lowered through sports modification or use of protective gear. A detailed explanation of this literature search and conclusions are available.³

In 2014, the CUA guideline was updated,⁴ following a review of updated 2008 AAP recommendations,¹ and repeating the methods as described previously.³ The 2014 revision included guidance regarding the operation of all-terrain vehicles. This 2019 revision, produced as a CUA Best Practice Report, was developed following a review of the relevant literature from 2014 to January 2019, and the current position statements of some North American pediatric medical societies. It is noted that there have been no further publications from the AAP on the topic of sports and the solitary kidney since 2012.⁵

Recommendations

In accordance with the AAP recommendations, the following information should be conveyed to the primary caregiver(s) of a young child with a single kidney. Supporting documentation is provided following each statement, with level of evidence based on the International Consultation on Urological Diseases (ICUD) system.

Primary caregivers of a young child with a single kidney should be informed of the following:

1. Their child has only one kidney and loss of that kidney would result in the need for dialysis or a renal transplant, and lifelong medications.
 - Evidence: *Indisputable*.
2. Significant renal injury, of any etiology, increases the risk/degree of renal insufficiency.
 - Evidence – Level 3: High-grade renal trauma results in ipsilateral renal scarring and volume loss on DMSA renal scan.⁶
3. While renal injury can result from contact/collision or limited-contact sports, the risks are less than the risk of head injury.
 - Evidence – Level 3: In American football, which is considered a “collision” sport, kidney injuries occur significantly less often than head injuries.⁵
 - Evidence – Level 3: Those sporting activities most associated with high-grade renal trauma (bicycling, sledding, downhill skiing, snowboarding, and equestrian), have more than a five times relative risk of head injury compared to renal injury.³
4. Primary caregivers should try to keep things in perspective; if they are not going to restrict a child from an activity based on the child having only one “head,” then they should not restrict the child from that activity based on having only one kidney.
 - Evidence – Level 3: Those activities most associated with high-grade renal trauma (bicycling,

- sledding, downhill skiing, snowboarding and equestrian), have more than a five times relative risk of head injury compared to renal injury.³
5. Wearing protective padding during contact/collision and limited-contact sports may decrease the risk of renal injury.
 - *Evidence – Level 4:* Although protective padding is available, there is no evidence to prove they prevent renal injuries.^{7,8}
 6. The exact risk of renal injury from each sport is unknown; however, according to available studies, bicycling, non-motorized sledding, downhill skiing/snowboarding, and horse-related activities may carry a higher risk than other activities.^{3,9,10}
 - *Evidence – Level 3:* Review of nine published articles (2000–2005) reporting on pediatric renal trauma in North America shows that bicycling, sledding, downhill skiing, snowboarding, and equestrian sports are implicated as the most common sports-related causes of high-grade renal trauma.³
 - a. Bicycle riding may be made safer for the child by proper maintenance of the bicycle and handlebars.
 - *Evidence – Level 3:* Minor bicycle crashes can result in serious handlebar-associated injuries.¹¹
 - *Evidence – Level 4:* As falling onto bicycle handlebars results in renal trauma, it is assumed, but not proven, that proper maintenance of the bicycle and handlebars would help prevent renal injuries.¹¹
 - b. Sledding and horse-related activities should be done in a safe manner, ideally with supervision.
 - *Evidence – Level 4:* Most serious sledding injuries occur when sledding is done near or on roadways, when being towed by a motorized vehicle, or when a stationary object is hit. Therefore, it is assumed, but not proven, that renal injuries are less likely if sledding is limiting to non-crowded, designated hills, ideally with parental supervision.^{12,13}
 - *Evidence – Level 4:* It is assumed, but not proven, that horse-related injuries might be prevented if: horses and activities are properly matched to the child's capabilities; children avoid standing in positions where they might be kicked; and there is parental supervision.^{14,15}
 - c. Downhill skiing may be safer than snowboarding. Injuries are more likely to occur in beginners. Formal instruction may be beneficial. Injuries are more likely to occur in inclement weather.
 - *Evidence – Level 3:* When compared, renal injuries were significantly higher in snowboarders than alpine skiers (all ages).¹⁶ When compared, abdominal injuries were significantly higher in snowboarders than alpine skiers (children).¹⁷
 - *Evidence – Level 3:* Injuries are more likely to occur in beginners (all ages).¹⁷
 - *Evidence – Level 3:* While the overall risk of injury may not be decreased by formal instruction, the risk of potentially severe injuries may be lowered by taking lessons (all ages).¹⁸
 - *Evidence – Level 3.* Overall injury risk is higher when inclement weather effects visibility and snow conditions.¹⁹
7. Motor vehicle collisions (MVCs) are a common cause of pediatric renal injury. Therefore, your child should always be in appropriate car restraints and be taught pedestrian and bicycle road safety.
 - *Evidence – Level 3:* Review of seven remote publications (2000–2005), reporting on pediatric renal trauma (all grades) in North America, showed that MVCs (including passenger and pedestrian) resulted in more renal trauma than sporting activities.³
 - *Evidence – Level 3.* Review of two recent publications reporting on pediatric renal trauma (all grades) between the years 1993–2014 shows that MVCs (including passenger and pedestrian) were responsible for 16²⁰–19%²¹ of renal injuries.
 8. The use of all-terrain vehicles (ATVs) by children is associated with high-grade kidney trauma. However, unlike other recreational activities mentioned in this report, some states in the U.S. have strict regulations regarding ATV use in children, and a number of pediatric medical societies provide formal recommendations against the operation of ATVs by all children less than 16 years of age, regardless of kidney number.
 - *Evidence – Level 3:* Renal injuries from two-, three- and four-wheeled recreational vehicles are associated with higher-grade renal injuries than those caused by bicycle injuries.⁷
 - *Evidence – Level 3:* Massachusetts has strict state regulations regarding ATV use

in children.²² As such, a Boston pediatric trauma center reported no renal injuries secondary to ATV use over a 20-year period (1994–2014).²⁰ This is in comparison to Pennsylvania, where during a similar period (1993–2013), ATV use accounted for 17% of high-grade paediatric trauma.²¹

- Societies recommending against ATV operation in children include:
 - American Academy of Pediatrics 2018²³
 - American Pediatric Surgical Association 2018²⁴
 - Canadian Pediatric Society 2012²⁵

Summary

1. The CUA supports the 2008 recommendations of the AAP that suggest that for children with a solitary kidney, no restrictions be placed on noncontact sports, and that clinical judgement be used regarding placing any restrictions on contact/collision and limited-contact sports.
2. Caregivers should be informed about the sports that may carry a higher risk of renal injury and the potential ways to reduce these risks as described in points 5 and 6 above; however, they should also be encouraged to keep things in perspective, as described in point 4 above.
3. Children with solitary kidneys should always be placed in appropriate car restraints and be taught pedestrian and bicycle road safety.
4. The CUA supports the recommendations of the pediatric societies that recommend against ATV operation in all children as described in point 8 above.

Competing interests: The authors report no competing personal or financial interests related to this work.

Prior to publication, this BPR underwent review by the CUA Guidelines Committee, CUA members at large, the CUAJ Editorial Board, and the CUA Executive Board.

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