Evidence Summary:
Field Hockey

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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.*

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UBC BC Children's Hospital Research Institute

Evidence synthesis tool

SPORT:	Field Hockey	**Target Group:**	All ages
Injury Mechanisms:	Contact with the stick or ball is the most common mechanism of injury (60% of all game-related injuries)		

Incidence/Prevalence	**Risk/Protective Factors**	**Interventions**	**Implementation/Evaluation**	**Resources**
The number of injuries per 1000 player-hours in International Hockey Federation tournament play ranges from 23.4-44.2 in women and 20.8-90.9 in men (Theilen, Mueller-Eising, Wefers Bettink, & Rolle, 2016). The overall injury rates in collegiate women have been estimated at 7.87/1000 (95% CI 7.43-8.31) AE in games and 3.70/1000 AE (3.54-3.86) in practices (Dick et al., 2007). High school girls' injury rates have been estimated at 1.4/1000 AE in practice and 4.9/1000 AE in games (Powell & Barber-Foss, 1999). Injuries to the ankle, knee, hand, and head/face are common regions of injury (Murtaugh 2009; Podgòrski 2011).	**Playing Environment and Timing** Participation in games versus practices is associated with an increased risk of all injury and concussion. Older ages, playing after the first quarter, and artificial turf are all associated with an increased risk of injury (Dick et al., 2007; Murtaugh, 2009; Theilen et al., 2016, Powell & Barber-Foss, 1999). **Sex** Males appear to be at an increased risk of injury (3.2 times in Olympic play) and time-loss injury (OR=6.0) compared to females. Further, boys are more likely to incur lacerations (IPR=1.56; 95% CI 1.09-2.24), upper limb injuries (IPR=2.31; 95% CI 1.10-4.84), and facial injuries than girls in youth play (Murtaugh, 2009; Yard & Comstock, 2006) Murtaugh, 2009; Yard & Comstock, 2006). **Peak Dorsiflexor Torque** Poor peak dorsiflexor torque at the ankle has associated with an increased risk of ankle injuries (Murtaugh, 2009)	**Neuromuscular Training** Participation in neuromuscular training programs, ankle-stabilizing programs, or prophylactic taping have been shown to significantly reduce the risk of ankle injury by as much as 50% (Murtaugh, 2009; Podgórski & Pawlak, 2011; Yard & Comstock, 2006). Prophylactic core strengthening has been shown to help prevent back injury and back complaints in field hockey players (Murtaugh, 2009). Players stronger in peak eccentric lumbar extension may be less likely to suffer back pain (Murtaugh, 2009). **Rules/Policy** Mandated use of protective eyewear has significantly reduced the incidence of eye/orbital injuries (OR: 3.20; 95% CI 1.47-6.99), and severe eye/orbital and head/face injuries (Kriz et al., 2015).	Players are encouraged to wear mouth guards, and the proportion of players reporting wearing a mouth guard has increased over the past 20 years (Vucic et al., 2016).	**Websites** Ontario Physical Education Safety Guidelines: http://safety.ophea.net/safety-plan/165/1402 Kids Health: http://kidshealth.org/en/teens/field-hockey-safety.html

	Equipment- Gloves The risk of hand injury is significantly higher in athletes not wearing gloves OR: 2.12 95% CI 1.86-2.41 (Murtaugh, 2009).			
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50(11), 657-660. Powell, J. W., & Barber-Foss, K. D. (1999). Injury patterns in selected high school sports: a review of the 1995-1997 seasons. *Journal of Athletic Training, 34*(3), 277	field hockey athletes presenting to United States emergency departments, 1990-2003. *Journal of Athletic Training, 41*(4), 441.			

Review of Sport Injury Burden, Risk Factors and Prevention

Field Hockey

Incidence and Prevalence

Summarizing an overall injury rate in field hockey is challenging due to varying injury definitions, age groups, and competition levels (Murtaugh, 2009). The number of injuries per 1000 player-hours in International Hockey Federation tournament play varies between 23.4-44.2 in women (average 29.1; 95% CI 18.6-39.7) and 20.8-90.9 (average 48.3; 95% CI 30.9-65.8) in men (Theilen, Mueller-Eising, Wefers Bettink, & Rolle, 2016). The overall injury rate in collegiate women has been estimated at 7.87/1000 (95% CI 7.43-8.31) athlete exposures (AE) in games and 3.70/1000 AE (3.54-3.86) in practices (Dick et al., 2007), and are both higher than the estimated rates in girls' high school (4.9/1000 AE in games and 1.4/1000 AE in practice) (Powell & Barber-Foss, 1999). The lower limb is the most common injury site with ankle sprains being the most common injury (Murtaugh, 2009; Podgórski & Pawlak, 2011); however, knee injuries have also been frequently reported in female players (Podgórski & Pawlak, 2011). The incidence of first time ankle injuries in female high school and collegiate players has been reported at 0.9/1000 person-days (95% CI 0.4-1.9) (Murtaugh, 2009). Upper limb injuries are the second most common site of injury, with most of these injuries occurring to the hand (Murtaugh, 2009). Finger fractures are a common hand injury in female field hockey players (Podgórski & Pawlak, 2011). Contact with the stick or ball are the most common mechanisms of injury, and have been reported to account for approximately 60% of total game injuries (Murtaugh, 2009). The majority of injuries occurred either in the circle (50% in women and 51% in men) or the 25-yard zone (34% in women and 32% in men) in International tournament play (Theilen et al., 2016). Similarly, most head/face/neck (71%) and hand/finger/thumb (68%) injuries in female collegiate play also occurred near the goal or within the 25-yard line (Dick et al., 2007).

Injuries to the head/face are another common injury site, which are typically lacerations, contusions, or hematomas. However, more severe injuries, such as severe eye injury, dental injury, and concussions can and do occur (Kriz et al., 2015; Murtaugh, 2009). Based on a recent systematic review and meta-analysis, on average 21.5% (95% CI 5.7-37.4%) of players have experienced at least one dentofacial trauma (Vucic, Drost, Ongkosuwito, & Wolvius, 2016). When stratified by level of play, 45.2% (95% CI 39.3-51.0%) of elite players reported an injury compared to 12.7% (95% CI 8.5-17.0%) of junior and senior players (Vucic et al., 2016). The overall incidence of head, face, and eye injuries was 0.94/1000 AE (95% CI 0.86-1.19) in collegiate women (Gardner, 2015). Even though field hockey is a non-contact sport, concussions have been reported to account for 1.7-7.7% of total acute injuries (Murtaugh, 2009), and 43% of all head, face, and eye injuries in collegiate women (Gardner, 2015). The estimated incidence of concussion is lower in youth (including both males and females; ages <18) at 0.10/1000 AE (95% CI 0.08-0.12) (Pfister, Pfister, Hagel, Ghali, & Ronksley, 2016), versus 0.40/1000 AE (95% 0.32-0.53) in older collegiate women (Gardner, 2015).

Risk and Protective Factors

Participation in games versus practices is associated with an increased risk of all injury (RR=2.1; 95% CI 2.0-2.3) (Dick et al., 2007; Murtaugh, 2009; Theilen et al., 2016), and the likelihood of receiving a concussion in game play is 6 times higher than practice (Dick et al., 2007; Podgórski & Pawlak, 2011). Older versus younger age categories are also associated with higher rates of practice and game-related injury (Dick et al., 2007; Powell & Barber-Foss, 1999). In addition, it has been noted that the rate of injury was highest after the first quarter in FIH tournament play (Theilen et al., 2016). Type of playing surface has also been reported as a risk factor for injury. Specifically, artificial turf has been associated with an increase in both acute and chronic injuries (Murtaugh, 2009; Podgórski & Pawlak, 2011). Artificial turf is associated with a high rate of abrasions (turf burn), and has been reported to account for up to 9% of acute injuries (Murtaugh, 2009).

Males appear to be at an increased risk of injury and severe injury compared to females. Specifically, men had 3.2 times the risk of a game-related injury than females in Olympic play, and men were more likely to sustain a time-loss injury in a game (OR=6.0). Boys have also been reported to incur more lacerations (IPR=1.56; 95% CI 1.09-2.24), upper limb injuries (IPR=2.31; 95% CI 1.10-4.84), and facial injuries than girls in youth play (Murtaugh, 2009; Yard & Comstock, 2006). Because mid-fielders are often involved in tackling situations, it has been proposed that they are at the highest risk of injury than other position (Murtaugh, 2009). However, the relationship between injury and playing position remains inconclusive (Murtaugh, 2009). Poor peak dorsiflexor torque at the ankle has associated with an increased risk of ankle injuries, which may be due to excessive movement and stress on the lateral ligaments of the ankle joint (Murtaugh, 2009).

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

Participation in neuromuscular training programs, ankle-stabilizing programs, or prophylactic taping have been shown to significantly reduce the risk of ankle injury by as much as 50% (Murtaugh, 2009; Podgórski & Pawlak, 2011; Yard & Comstock, 2006). Field hockey does not mandate either helmets or gloves to be worn (Federation), yet the use of both may significantly reduce injuries (Podgórski & Pawlak, 2011). The risk of hand injury is significantly higher in athletes not wearing gloves, where the odds of an injury was two times higher for players not wearing them compared to those that were (OR: 2.12 95% CI 1.86-2.41) (Murtaugh, 2009). In 2011, the National Federation of State High School Associations (NFHS) mandated all US high school field hockey players to wear protective eyewear for all NFHS-sanctioned competitions (Black, Patton, Eliason, & Emery, 2017; National Federation of State High School Associations). This mandate significantly reduced the odds of eye/orbital injury by three-fold (OR: 3.20; 95% CI 1.47-6.99), as well as the risk of severe eye/orbital and head/face injuries (Kriz et al., 2015). However, because the entire head and face is at risk for injury in field hockey, it has been recommended that players may benefit even more from wearing a helmet with full facial protection (Dick et al., 2007; Kriz et al., 2015). Players are encouraged by the International Field Hockey Federation to wear mouth guards, and the proportion of players reporting wearing a

mouth guard has increased from 31.4% (95% CI 22.7-40.1%) to 84.5% (95% CI 69.3-99.7%) over the past 20 years (Vucic et al., 2016). The reasons reported why players do not wear oral protection include not feeling they are necessary, problems with speech, difficulty breathing, and the mouth guards being uncomfortable (Black et al., 2017; Vucic et al., 2016).

Prophylactic core strengthening has been shown to help prevent back injury and back complaints in field hockey players (Murtaugh, 2009). Due to the nature of the game, players are in a forward flexed, semi-rotated position for prolonged periods of time that can lead to posture asymmetries (Murtaugh, 2009). Flexibility has not been shown to reduce the incidence of back pain in field hockey players, although one study suggested players stronger in peak eccentric lumbar extension reported being pain free (Murtaugh, 2009). Given the high rate of lacerations and abrasions, it has been recommended that players all have up to date tetanus vaccinations prior to participation (Murtaugh, 2009). Though it has been suggested that removing the penalty corner and replacing it with a power play may help reduce serious injury (Batten, White, & Anderson, 2016), some authors have cautioned this idea as it has yet to be examined (Rolle & Wefers Bettink, 2016).

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