ACTIVE & SAFE

Evidence Summary:
Golf

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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:	Golf	**Target Group:**	All age ranges
Injury Types and Mechanisms:	The most common injuries in golf are overuse injuries. The elbow is the most affected region, followed by the back and shoulder. Mechanisms tend to be related to the biomechanics of the golf swing. (Cabri, Sousa, Kots, & Barreiros, 2009)		

Incidence/Prevalence	**Risk Factors**	**Interventions**	**Implementation/Evaluation**	**Resources**
Overall More information is needed on the incidence and prevalence of golf injuries; however, literature has reported that most golfing injuries tend to be from overuse or from a traumatic cause, and the most common sites of injury include the lower back, elbow, wrist, and shoulder. (Cabri et al., 2009). **Amateur Golfers** The incidence rate of golf-related injuries in amateur golfers is estimated to be 15.8 injuries per 100 golfers. The prevalence of golf-related injuries among amateur players is estimated to range between 25.2% and 62.0%. (Cabri et al., 2009) On a per year basis, injury rates vary between 1.19 and 1.31 injuries per amateur golfer. (Cabri et al., 2009)	There are very few high-quality studies examining risk factors for injuries in golf. There are studies that suggest risk factors for injury and they include: previous injury, over practicing, improper warming up, older aged beginners, and improper technique. (Cabri et al., 2009; Sherman & Finch, 2000) **Previous Injury** The literature suggests that approximately 60% of professionals and 40% of amateur golfers have sustained injuries. Once, injured, these individuals are reported to be more susceptible to subsequent injuries. (Gosheger et al., 2003) **Over Practicing** It has been proposed that amateurs who play two rounds a week tend to have overuse injuries as a result of striking the ground with the club and poor swing mechanics. (Cabri et al., 2009)	There are no studies that evaluated the effectiveness of an intervention on injury outcomes in golf. Most of the literature making recommendations towards prevention of injury in golf focuses on better equipment such as shoes and clubs. (Sherman & Finch, 2000) More information is required on what types of shoes should be recommended for golfers, while clubs with graphite shafts are recommended rather than clubs with steel shafts due to their lighter weight and shock absorption properties that can potentially reduce stress on the body. (Sherman & Finch, 2000) Proper warm ups have been suggested as a strategy that can reduce injuries. According to a survey of 522 female golfers, golfers who did not warm up on a regular basis were 45 times more	Currently there is limited research on the implementation of interventions for golfing.	**Websites** http://www.sportsmed.org/aossmimis/stop/downloads/Golf.pdf

The most common sites of injury in golf include the low back, elbow, wrist and hand, and the shoulder. (Cabri et al., 2009; Lindsay & Vandervoort, 2014; Sherman & Finch, 2000) **Professional Golfers** Injury rates in professional golfers are close to two injuries per golfer per year, with a prevalence rate of approximately 89%. (Cabri et al., 2009) The most common sites of injuries for professional golfers include the head, the lumbar spine, and the wrist/hand. (Lindsay & Vandervoort, 2014; Sherman & Finch, 2000) One study indicated that 60% of professional golfers experienced a traumatic or overuse golf injury compared to only 40% of amateur golfers. (McHardy, Pollard, & Luo, 2006; Sherman & Finch, 2000)	**Improper Warm Up** Most golfers do not normally warm up before participating, (Fradkin et al., 2007) and this is believed to present a risk for many common injuries; according to a survey of 522 female golfers, golfers who did not warm up on a regular basis were 45 times more likely to have sustained a golfing injury in the 12 months prior than those reported frequent warm-up (OR=45.2; 95%CI:13.5,151.7). Some studies report that preventative measures such as warming-up, conditioning and using proper swing mechanics can reduce the risk of injury in golf. (Cohn, Lee, & Strauss, 2013; Fradkin, Cameron, & Gabbe, 2007) **Older Age Beginners** Literature suggests that those who begin golfing later in life (over 50 years old) tend to have a higher total number of injuries compared to their younger peers. This may be due to changes in physiology and the musculoskeletal system as a result of the aging process; (Cabri et al., 2009) however, there are no studies directly comparing injuries between different age groups, therefore more information is needed about age as a risk factor for injury. **Improper Technique**	likely to have sustained a golfing injury in the 12 months prior than those reported frequent warm-up (OR=45.2; 95%CI:13.5,151.7). (Fradkin et al., 2007). Unfortunately, this study did not identify what type of warm-up the participants were doing. Another important factor that should be considered to prevent injuries in golf is proper training programs that include strength training, core stabilization, shoulder exercises and periodization to limit overtraining injuries. (Lehman, 2006) **Cost Effectiveness** There is no information about the costs associated with programs to reduce golf injuries; however, consideration should be taken to the extent of overuse injuries in the context of chronic, long-term pain.		

	Technique and proper biomechanical movement is extremely important within the game of golf. (Fradkin et al., 2007; Lindsay & Vandervoort, 2014; Sherman & Finch, 2000) Injuries in golf can be associated with poor technique, limited flexibility, badly executed strength training, and lack of physical conditioning. (Cabri et al., 2009; Lehman, 2006; Lindsay & Vandervoort, 2014; Sherman & Finch, 2000) Other factors include poor swing dynamics leading to excessive side-bend and over-rotation of the spine, poor trunk endurance, and restricted lead hip internal rotation, which if practiced over time, may lead to injury. (Cabri et al., 2009; Fradkin et al., 2007; McHardy et al., 2006)			

Works Cited: Cabri, J., Sousa, J.P., Kots, M., & Barreiros, J. (2009). Golf-related injuries: a systematic review. *European Journal of Sport Science,* 9(6), 353–366. Lindsay, D.M., & Vandervoort, A.A. (2014). Golf-related low back pain: a review of causative factors and prevention strategies. *Asian Journal of Sports Medicine*, 5(4), e24289. McHardy, A., Pollard, H., & Luo, K. (2006). Golf injuries. *Sports Medicine*, 36(2), 171–187. Sherman, C.A., & Finch, C.F. (2000). Preventing injuries to competitive and recreational adult golfers: what is the evidence? *Journal of Science and Medicine in Sport*, 3(1), 65–78.	**Works Cited:** Cabri, J., Sousa, J.P., Kots, M., & Barreiros, J. (2009). Golf-related injuries: a systematic review. *European Journal of Sport Science,* 9(6), 353–366. Cohn, M.A., Lee, S.K., & Strauss, E.J. (2013). Upper extremity golf injuries*. Bulletin of the Hospital for Joint Diseases,* 71(1), 32–38. Fradkin, A.J., Cameron, P.A., & Gabbe, B.J. (2007). Is there an association between self-reported warm-up behaviour and golf related injury in female golfers? *Journal of Science and Medicine in Sport*, 10(1), 66–71. Gosheger, G., Liem, D., Ludwig, K., Greshake, O., Winkelmann, W. (2003). Injuries and overuse syndromes in golf. Am J Sports Med, 31(3). Lindsay, D.M., & Vandervoort, A.A. (2014). Golf-related low back pain: a review of causative factors and prevention strategies. *Asian Journal of Sports Medicine*, 5(4), e24289. McHardy, A., Pollard, H., & Luo, K. (2006). Golf injuries. *Sports Medicine*, 36(2), 171–187. Sherman, C.A., & Finch, C.F. (2000). Preventing injuries to competitive and recreational adult golfers: what is the evidence? *Journal of Science and Medicine in Sport*, 3(1), 65–78	**Works Cited:** Fradkin, A.J., Cameron, P.A., & Gabbe, B.J. (2007). Is there an association between self-reported warm-up behaviour and golf related injury in female golfers? *Journal of Science and Medicine in Sport*, 10(1), 66–71. Lehman, G. J. (2006). Resistance training for performance and injury prevention in golf. *Journal of the Canadian Chiropractic Association*, 50(1), 27. Sherman, C.A., & Finch, C.F. (2000). Preventing injuries to competitive and recreational adult golfers: what is the evidence? *Journal of Science and Medicine in Sport*, 3(1), 65–78		

Review of Sport Injury Burden, Risk Factors and Prevention

Golf

Incidence and Prevalence

With over 55 million participants and a 10% increase in people joining every year, golf is gaining popularity across all age groups. (Cabri et al., 2009). Although normally considered low-intensity, the risk of injury in golf is moderate. (Cabri et al., 2009) Injury rates are estimated to be between 1.19 and 1.31 injuries per golfer per year for amateurs and close to 2 injuries per year for professionals. (Cabri et al., 2009) Like incidence rates, the prevalence rates for golfers also differ depending on level of play. For amateur golfers, the prevalence rates of injury range from 25.2%-62.0% while for professional golfers the prevalence rate of injury is closer to 89%. (Cabri et al., 2009)

Golf injuries are most often the result of overuse and occur in the elbow, back, shoulder, wrist, and hand. (Sherman & Finch, 2000; Lehman, 2006; McHardy, Pollard, & Luo, 2006; Fradkin, Cameron, & Gabbe, 2007; Cabri et al., 2009; Lee & Strauss, 2013) Common injury sites differ slightly between levels of play. Amateur golfers tend to have more injuries to the lower back, elbow, wrist, hand, and shoulder, while professional golfers tend to have more head, lumbar spine, wrist and hand injuries.

Risk and Protective Factors

There are very few high-quality studies examining risk factors for injuries in golf. The main risk factors proposed across the literature are previous injury, over practicing/excessive play, improper warming up, older aged beginners, a lower handicap, and improper golfing technique. (Cabri et al., 2009; Sherman & Finch, 2000)

The literature suggests that approximately 60% of professionals and 40% of amateur golfers have sustained injuries. Once, injured, these individuals are reported to be more susceptible to subsequent injuries. (Gosheger et al., 2003) In addition, both amateur and professional golfers are prone to overuse injuries. (Sherman & Finch, 2000; McHardy et al., 2006; Cabri et al., 2009; Lindsay & Vandervoort, 2014) It has been proposed that risk factors for overuse injuries include lack of proper warm-up, limited mobility, reduced flexibility, lack of strength training, incorrect form (over-rotation and excessive bending), and lack of physical conditioning. (Sherman & Finch, 2000; Cabri et al., 2009; Cohn et al., 2013; Lindsay & Vandervoort, 2014) Proper strength training of correct muscle groups and periodization to ensure that athletes are not overtraining can prevent overuse injuries in golfers. (Lindsay & Vandervoort, 2014)

Most golfers do not normally warm up before participating. (Fradkin et al., 2007) It is believed that many common injuries in golf can be avoided with warming-up, conditioning and using proper swing mechanics. (Cohn, Lee, & Strauss, 2013; Fradkin, Cameron, & Gabbe, 2007)

There is some evidence suggesting that those who begin golfing later in life (over 50 years old) have a higher total number of injuries compared to their younger peers. (Cabri et al., 2009) A reason for this has been suggested as changes in musculoskeletal physiology during the aging process; (Cabri et al., 2009) however, there are no studies directly comparing injuries between different age groups, therefore more information is needed about age as a risk factor for injury.

Technique and proper biomechanical movement is extremely important when playing the game of golf. (Fradkin et al., 2007; Lindsay & Vandervoort, 2014; Sherman & Finch, 2000) Poor swing dynamics can lead to excessive side-bend and over-rotation of the spine, poor trunk endurance, and restricted lead hip internal rotation. If these movements are practiced over time, they can lead to an increased risk of injury. (Cabri et al., 2009; Fradkin et al., 2007; McHardy et al., 2006)

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

There is a lack of information on the implementation and evaluation of injury prevention interventions in golf. (Cabri et al., 2009) Much of the literature reports on the most effective swing or best golf clubs, to reduce the risk of injury. (Sherman & Finch, 2000) While further research is needed to determine the best shoe type for golfers, clubs with graphite shafts are recommended over those with steel shafts due to their lighter weight and shock absorption properties that can potentially reduce stress on the body. (Sherman & Finch, 2000)

Most intervention strategies to prevent golfing injuries focus on warming up and strength training to prevent injuries. One study found that approximately one-third (35.2%) of golfers reported at least one golfing injury within the previous year. Golfers who reported frequently warming up were 45 times less likely to suffer injuries over those who did not. (Fradkin et al., 2007) Golfers who did not warm up were 45 times more likely (OR=45.2; 95%CI: 13.5,151.7) to suffer an injury compared to those that did not warm up. (Fradkin et al., 2007). Other studies show that improvement in golf swings through conditioning programs that focus on increasing trunk stability; enhancing shoulder control; strength training and periodization are effective in preventing injuries. (Lehman, 2006; Cabri et al., 2009; Cohn et al., 2013) Further research is needed to evaluate the effectiveness of strength training, warm-ups and equipment on injury prevention in golf.

Limiting practice or play time, obtaining professional assessment, regulating swing mechanics, increasing trunk and hip flexibility, wearing proper footwear, and employing proper lift mechanics (or avoidance of lifting the golf bag) have also been proposed to reduce the risk of injury in golfers. (Cohn, Lee, & Strauss, 2013; Fradkin, Cameron, & Gabbe, 2007Cabri et al., 2009; Lindsay & Vandervoort, 2014). Proper training programs that include strength training, core stabilization, and shoulder exercises should be considered as part of an injury prevention program in golf. (Lehman, 2006)

While there are no studies that evaluated the effectiveness of an intervention on injury outcomes in golf, some of the next steps for risk factor research are evaluating environmental factors and better equipment.

References

Cabri, J., Sousa, J.P., Kots, M., & Barreiros, J. (2009). Golf-related injuries: a systematic review. *European Journal of Sport Science, 9*(6), 353–366.

Gosheger, G., Liem, D., Ludwig, K., Greshake, O., Winkelmann, W. (2003). Injuries and overuse syndromes in golf. *Am J Sports Med*, 31(3).

Cohn, M.A., Lee, S.K., & Strauss, E.J. (2013). Upper extremity golf injuries. *Bulletin of the Hospital for Joint Diseases, 71*(1), 32–38.

Fradkin, A.J., Cameron, P.A., & Gabbe, B.J. (2007). Is there an association between self-reported warm-up behaviour and golf related injury in female golfers? *Journal of Science and Medicine in Sport, 10*(1), 66–71.

Lehman, G. J. (2006). Resistance training for performance and injury prevention in golf. *Journal of the Canadian Chiropractic Association, 50*(1), 27.

Lindsay, D.M., & Vandervoort, A.A. (2014). Golf-related low back pain: a review of causative factors and prevention strategies. *Asian Journal of Sports Medicine, 5*(4), e24289. doi: 10.5812/asjsm.24289.

McHardy, A., Pollard, H., & Luo, K. (2006). Golf injuries. *Sports Medicine, 36*(2), 171–187.

Sherman, C.A., & Finch, C.F. (2000). Preventing injuries to competitive and recreational adult golfers: what is the evidence? *Journal of Science and Medicine in Sport, 3*(1), 65–78.