

# Snowtime

## Managing common injuries on the slopes

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**Patients with injuries related to snow sports commonly present to GPs on their return from the mountains. We discuss the common injuries sustained by skiers and snowboarders, their treatment, when to refer and simple measures to help prevent these injuries.**

**S**kiing and snowboarding are popular recreational activities in Australia and New Zealand. However, these sports carry a significant risk of injury. In the US in 2014, there were 114,000 skiing injuries and 79,000 snowboarding injuries, with an average of 2.5 skier injuries per 1000 skier days.<sup>1,2</sup> Over winter, there is often an increase in patients presenting to GPs with injuries related to snow sports.

This article provides a brief overview of common injuries associated with skiing and snowboarding, their treatment, including when to refer patients for specialist care, and the rehabilitation required afterwards. Some practice points regarding snow sports injuries are summarised in Box 1. We also discuss preventive strategies that GPs can discuss with patients before they go skiing or snowboarding to minimise the risk of injury.

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### Lower limb injuries

#### Knee injuries

Injuries to the knee are common during skiing because of the changes of direction, speed and body position. They account for 30 to 40% of skiing injuries.<sup>3</sup>

The medial collateral ligament (MCL) is most often injured by twisting or during a fall that causes a valgus stress to the knee. Patients with mild sprains of the MCL (the ligament is stretched but not torn) can be treated with simple first aid measures: ice, elevation, anti-inflammatories and rest. Those with more severe sprains (grade 2 and above, defined as partial or full MCL tears) require immobilisation in a hinged knee brace to prevent valgus deformity. Patients with grade 2 or higher MCL injuries require referral to a physiotherapist, orthopaedic knee surgeon or sports physician. Patients can expect to return to normal activities after four to eight weeks. However, those with even more severe injuries, particularly if multiple ligaments or other intra-articular pathology are involved, may require surgery and prolonged rehabilitation.

Ironically, the anterior cruciate ligament (ACL) is vulnerable to injury during skiing as ski boots support the ankle and divert forces through the knee (Figure 1). Patients with an ACL injury present with an acutely painful and swollen knee that often feels rotationally unstable. They sometimes report feeling or hearing a pop at the time of the injury. An MRI scan will confirm the diagnosis and also identify any coexistent intra-articular pathology, such as a meniscal tear or cartilage defect. Patients with an ACL injury require extensive physiotherapy to strengthen the quadriceps and compensate for the loss of stability previously provided by the ACL. They often require surgical reconstruction with a hamstring or patella tendon graft. Patients with an ACL injury require referral to a physiotherapist and a knee surgeon.

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## 1. PRACTICE POINTS REGARDING SNOW SPORTS INJURIES

- Skiing and snowboarding carry a significant risk of injury, but this risk may be reduced by simple measures such as wearing protective equipment that fits well.
- Knee injuries account for 30 to 40% of injuries to skiers but are less common in snowboarders, who are more likely to sustain wrist fractures.
- Other common snow sports injuries include tibial fracture, shoulder injuries and skier's thumb; snowboarder's ankle is rare but important to recognise.
- The incidence of head injuries during snow sports has declined with helmet wearing; persisting symptoms after a minor head injury require investigation.
- Many limb injuries require further assessment by a physiotherapist or orthopaedic surgeon.

They can expect to be out of sporting activity for six months to a year.

Knee injuries are less common in snowboarders, who have both feet fixed to the board, limiting the torsional force to the knee. However, high-risk activities for knee injuries among snowboarders include dismounting lifts and 'scooting' along flat sections, when only one foot is strapped to the board with a non-releasable binding.

### Tibial fractures

Tibial fractures account for 5% of skiing injuries. They often occur at the level of the top of the ski boot. About 10% are due to collisions, with the most common cause being a forward fall with a binding malfunction. The release force setting for the bindings is usually based on the fracture strength of the tibia. Improved binding-release technology has reduced the incidence of tibial fractures.<sup>2</sup> Patients with a tibial fracture are treated with either cast immobilisation or surgical fixation, depending on the fracture characteristics (Figures 2a and b). They require referral to an orthopaedic surgeon or fracture clinic.

A study in Finland in 2016 showed 11 times more tibial fractures in skiers than in snowboarders.<sup>4</sup> Skiers sustained the fractures during falls, whereas in snowboarders they more often occurred after a jump. In skiers, 63% of tibial fractures were shaft fractures and 27% were proximal tibial fractures, whereas in snowboarders, 37% were shaft fractures and 43% were proximal tibial fractures. With changes in ski design, proximal tibial fractures have increased in adult skiers. More than half the fractures were in children, who have four times higher risk of tibial fracture than adults, as their tibia will fracture with less bending and twisting force. These are usually low-energy, simple fractures that can be treated with an immobilisation cast.

### Foot and ankle injuries

With the development of stiffer ski and snowboard boots, there has been a 92% drop in ankle injuries since 1970.<sup>2</sup> Snowboarders are more likely to sustain foot or ankle injuries than skiers, including ankle sprains, ankle fractures and talus fractures. Ankle fractures accounted for 1.9% of snowboarding injuries and 1.1% of skiing injuries, with more medial malleolar injuries in snowboarders.

Fractures of the lateral process of the talus (known as 'snowboarder's ankle') are

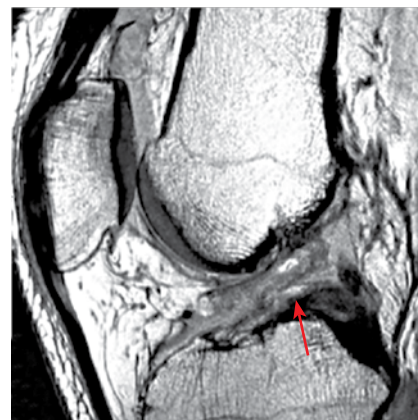


Figure 1. MRI showing rupture of the anterior cruciate ligament (arrow).

rare, accounting for 0.2% of snow sports injuries.<sup>5</sup> However, they are often missed on plain x-rays. Patients with persisting pain should be investigated with MRI or CT. Lateral talus fractures are often treated conservatively but may require surgery if displaced. There is a risk of subsequent post-traumatic arthritis. These patients require referral to a foot and ankle orthopaedic surgeon or a fracture clinic.

### Upper limb injuries

#### Shoulder injuries

Heavy falls with arms outstretched can result in shoulder dislocation. This



Figures 2a and b. Fracture of the tibia and fibula in a skier after a fall in which the ski bindings failed to release. The tibial fracture was treated with minimally invasive plate fixation.



**Figure 3.** Displaced mid-shaft fracture of the clavicle, potentially requiring operative intervention.

requires emergency reduction at the ski field to minimise neurovascular injury. Following this, the patient may present with the shoulder immobilised in a sling. Further management will depend on whether this is an initial or recurrent dislocation, and whether there is an associated fracture. Patients should be referred to an orthopaedic shoulder surgeon and a physiotherapist. The risk of recurrent dislocation is high for young patients.

The rotator cuff comprises four muscles (supraspinatus, infraspinatus, subscapularis and teres minor), which are required for

normal shoulder function. These can be torn acutely or can degenerate, causing pain on raising the arm or reaching behind. MRI will confirm the diagnosis. Patients with a rotator cuff injury can often be managed with physiotherapy, with or without a corticosteroid injection. Occasionally, they require surgical intervention.

Clavicle fractures are another common shoulder injury among skiers and snowboarders. This is usually caused by a direct fall onto the shoulder. Clavicle fractures vary from undisplaced simple fractures that can be treated with a sling for comfort, to comminuted, displaced and shortened fractures that may require surgical fixation (Figure 3). Patient referral to an orthopaedic shoulder surgeon or fracture clinic is appropriate for this decision-making. Clavicle fractures in snowboarders are the only injury that increases in incidence as they become more experienced, thought to be a result of their attempting tricks and using board parks.<sup>5</sup>

### Wrist injuries

Wrist fractures affect snowboarders of all standards, whether they are learning to turn or are landing a big jump. Often patients with wrist fractures have extended both hands to lessen a fall and sustain a unilateral or bilateral wrist fracture. Wrist fractures account for 28% of snowboarding injuries and 2.8% of skiing injuries.<sup>5</sup> Patients may present to GPs in a splint or cast. The fracture may be managed with a splint, a cast or surgical fixation, depending on the degree of displacement and whether it involves the joint (Figure 4). Stiffness is often a problem after treatment and patients usually require physiotherapy. Patients with an intra-articular fracture have an increased risk of post-traumatic arthritis. Referral to a fracture clinic or upper limb surgeon is appropriate for all patients with wrist fractures to ensure they are managed appropriately.

### Hand injuries

Skier's thumb is the classic injury sustained when a person falls on an outstretched



**Figure 4.** Displaced intra-articular distal fracture of the radius, which required surgical fixation.

hand while clutching a ski pole. It accounts for 8 to 10% of ski injuries.<sup>2</sup> The ulnar collateral ligament of the thumb is stretched or ruptured (Figure 5). This can be misdiagnosed as a simple sprain, and undertreatment can result in ongoing disability. Skier's thumb may require cast immobilisation or surgical fixation. Patients require referral to a hand surgeon for assessment.

Fractures can also occur in the thumb. Dislocated intra-articular fractures involving the base of the thumb are known as Bennett's fracture. These are important to recognise, as treatment options vary from cast immobilisation for undisplaced fractures, to surgical fixation for displaced fractures. Patients should be referred to a hand surgeon or local fracture clinic.

### Head injuries

The incidence of head injuries during snow sports has declined by 43% since helmet wearing has become more popular.<sup>6</sup> However, head injuries still account for 10 to 20% of snow sports injuries. The usual mechanism of injury is following a fall, with the person either hitting their head on the ground, particularly if icy, or on an object such as a tree, rail or jump. Patients may present with headache, dizziness, confusion, drowsiness or altered vision.



**Figure 5.** Skier's thumb (avulsion of the ulnar collateral ligament from the proximal phalanx of the thumb) necessitating surgical intervention.



## 2. SIMPLE MEASURES TO HELP PREVENT SKIING AND SNOWBOARDING INJURIES<sup>7,8</sup>

- Wear protective equipment
  - a helmet designed for skiing or snowboarding (essential)
  - wrist guards if snowboarding
  - knee brace if previous injury
  - goggles
  - adequate layered clothing
- Ensure equipment fits well
  - make sure bindings have been safety tested
  - choose correct-sized boots and board or skis
  - ensure helmet is not loose
  - do not loop hands through the ski pole straps<sup>7</sup>
- Make sure fitness levels are adequate
  - undertake a conditioning program beforehand<sup>8</sup>
  - be aware of your limits
  - stop when tired
  - build up to complex runs
- Warm up before setting out for the day
- Stay well hydrated (dehydration affects decision-making)
- Take lessons
  - learn to fall properly
  - learn to mount and exit lifts safely
  - learn to assess the appropriateness of runs and terrain
- Obey safety rules and understand mountain priority rules; avoid avalanche risk areas
- Stay together as a group
- Always stay in control

These symptoms may have a delayed onset and are potentially fatal. Patients who experience any episode involving loss of consciousness need thorough investigation and monitoring. After a minor head injury, patients should rest for at least 48 hours and be referred for further investigation if symptoms persist.

### Spinal injuries

Although rare, spinal injuries can be catastrophic if missed. Any patient complaining of back pain following a fall on the ski field needs a full neurological examination, looking specifically at

power, sensation, tone and reflexes, and a rectal examination to assess the cauda equina. Imaging of the spine is required. A CT scan will most accurately diagnose fracture, although anteroposterior and lateral x-rays of the lumbar spine with focal tenderness may suffice. MRI may identify disc pathology or neurological injury without a fracture.

### Cold injuries

People who are underprepared for the mountain environment are at risk of hypothermia. Concerning features are confusion, slurred speech and drowsiness. Those who have been exposed to very low temperatures for long periods without adequate gloves or socks may experience frostbite. By the time they present in the clinic, they may have superficial skin changes, such as mottling, blisters and tingling, or in more severe cases, the digits may be blistered, numb, blackened or ulcerated. Patients with more severe frostbite potentially require referral to a plastic surgeon for assessment. Complications of frostbite include cold sensitivity, tissue loss, auto-amputation and paraesthesia.

### Prevention strategies

Most snow sports injuries occur when participants are fatigued at the end of the day, around lifts, on difficult terrain, with collisions or following poor judgement. Simple measures for skiers and snowboarders to minimise their risk of injury are shown in Box 2.<sup>7,8</sup> It is also highly recommended that skiers and snowboarders take out adequate snow sports insurance before participation to ensure they are covered in the event of an accident.

### Conclusion

Despite the risk of injury, skiing and snowboarding are excellent forms of exercise that will help patients stay healthy, and participation should be encouraged. Simple precautions can reduce the risk of injury and ensure participants stay safe and have fun.

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COMPETING INTERESTS: None.



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