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HEALTH — Safety first when it comes to winter sports

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Experienced snowboarder Jessica Gregorie was walking across the High Beaver Traverse, a steep passage outside the boundaries of the Alpine Meadows ski resort near Lake Tahoe, Calif., when she slipped on the icy terrain. The 24-year-old plunged downhill and over a cliff into a rocky crevice. Taken to a nearby trauma center, she later died from injuries sustained in the fall.

While rare, such incidents, along with a steady toll of serious injuries, are spurring a movement to improve safety for skiers and snowboarders. Industry groups and resort areas are offering new safety-education programs to raise awareness of risks in the backcountry, including falls and avalanches, while emphasizing the importance of personal responsibility in avoiding high-speed collisions on downhill runs and jumps. They are promoting the use of safety gear, especially helmets, which studies show can reduce the risk of head injury by as much as 50 percent. And to discourage reckless skiers and snowboarders, some resorts are instituting zero-tolerance policies that include confiscating season passes and day tickets.

In response to his daughter's death in February 2006 — which took place on a common route skiers and snowboarders from the resort use to reach fresh powder runs — Dan Gregorie, a physician and consultant based in Castine, Maine, started the California Ski and Snowboard Safety Organization [calskisafety.org]. The nonprofit, launched two months ago, promotes safety improvements in California snow sports and provides information on the safety of California ski resorts.

Bob Roberts, executive director of the California Ski Industry Association, says safety is his group's top priority, and member resorts are "constantly seeking to educate our clientele and promote safe practices on our slopes." But he points out the paradox of

snow-sport safety: For many participants, the inherent risks and challenges "are a vital part of the sport."

According to the National Ski Patrol, which trains and credentials emergency rescuers, more and more skiers and snowboarders are heading away from the more-predictable terrain of ski-area boundaries in search of untracked powder and adventure. Each year, avalanches claim more than 150 lives world-wide, a number that has been increasing over the past few decades — and thousands more are caught in avalanches, partly buried or injured, according to the National Snow and Ice Data Center at the University of Colorado.

Within the boundaries of U.S. snow resorts, meanwhile, there were 562 deaths to snowboarders and skiers during 761 million resort visits between 1992 and 2005, according to researchers at the University of Vermont and the Rochester Institute of Technology. The majority of the fatalities were skiers; experienced males between the ages of 18 to 43 accounted for most of the deaths, most commonly from severe head injuries resulting from high-speed impact with a tree. An estimated 100,000 to 140,000 injuries require treatment in an emergency room each year.

The National Ski Patrol, which offers safety tips on its nsp.org Web site, recommends that skiers and snowboarders who venture to the backcountry take avalanche safety courses and invest in equipment such as signal-emitting avalanche transceivers to help rescuers find them, along with probes and shovels, which can help them dig out. Safety experts also recommend carrying newer equipment such as the AvaLung, a filtration device that draws air directly from the snow pack to help victims avoid suffocation.

The National Ski Areas Association, a trade group that represents 325 resorts, aims to get the safety message across to the young, with a "Lids on Kids" helmet-awareness campaign and a contest for school children, who are being asked to create posters related to one of the seven points of the industry's "Your Responsibility Code." Among the rules: "People ahead of you have the right of way. It is your responsibility to avoid them."

World-wide, more efforts are being made to collect and analyze snow-sports injuries and make facilities such as snowboard jumps safer, according to Mike Langran, an Aviemore, Scotland, physician and U.K. national secretary for the International Society for Skiing Safety, a nonprofit group that includes physicians and industry members. Dr. Langran's Web site [www.ski-injury.com] includes advice on safety equipment such as helmets and wristguards for snowboarders and detailed information about the dangers of injuries.

"The issue we face all across snow sports is to keep things exciting and thrilling but not to the degree that safety becomes compromised," Dr. Langran says. For participants, he adds, "the simplest message is to ski or snowboard within the limits of your ability." That ability level can vary over the course of the day, and many injuries occur when experienced skiers are tired at the end of the day, "when their muscles are no longer able to sustain the turns they could do at lunchtime."

While new equipment such as improved boots and bindings in recent years has helped to cut down on orthopedic injuries, such equipment can also give less able and experienced skiers more confidence to attempt steeper slopes and more difficult terrain, says Paul Auerbach, a clinical professor of surgery at Stanford University School of Medicine's emergency division, who spent part of his vacation in late December on doctor patrol in Lake Tahoe with the National Ski Patrol.

Many of the injured he has treated this season were skiing or snowboarding too fast and lost control — and often were not wearing helmets, suffering concussions that could have been prevented. While helmet use has increased about 5 percent annually for the past several years to nearly 40 percent for skiers and snowboarders, "it still isn't where we'd like it to be," Dr. Auerbach says. "They are advised for skiers at any age and level of experience."

Dr. Auerbach also warns that many skiers also fail to adequately apply sunscreen or wear sunglasses or goggles with protection against the sun's ultraviolet rays; glare reflected off snow and ice can cause a condition known as snow blindness, akin to sunburn of the eyes, that can lead to permanent vision loss.

Skiers and snowboarders face thousands of other less serious but potentially painful or disabling injuries to the wrist, knee and shin bone. Shorter skis have sharply reduced the incidence of broken legs, but fractures of the shin bone have increased, often because ski bindings, which are designed to sense loads passing between the ski boot and the ski, don't always work properly to release the skis when a skier falls. Or they may release the skis inadvertently when the skier doesn't need them to. In either case, bones can snap just above the rigid top of the ski boot in a twisting fall. Ski experts suggest that skiers be more vigilant about annual inspection of their equipment to see if readjustments are needed to the bindings based on their weight or age, among other factors.

New bindings are also on the way that could help reduce the approximately 20,000 serious knee sprains each year in North America involving the anterior cruciate ligament, or ACL, which crosses the knee at a diagonal angle underneath the kneecap. Stowe, Vt., equipment designer Rick Howell, chief executive of KneeBinding Inc., is unveiling a new binding this year designed to release sideways when a twisting fall puts direct strain on the ACL; current bindings are unable to release the ski in that motion. Mr. Howell says the binding will not release inadvertently.

Reckless skiers and snowboarders are facing more frequent lawsuits, as well as occasional criminal and civil prosecution for injuries caused to others. Ski resorts, though, are rarely held liable except in cases of negligence because of state statutes that exempt them due to the inherent risks in the sport.