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BRIEF REPORT

Injury Patterns in Recreational Alpine Skiing and Snowboarding at a Mountainside Clinic

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Objective.—The purpose of this study was to examine the demographic and injury characteristics of skiing and snowboarding at a mountainside clinic.

Methods.—Prospectively collected data of all acutely injured patients at the Big Sky Medical Clinic at the base of Big Sky Ski Area in the Northern Rocky Mountains were reviewed. A total of 1593 patients filled out the study questionnaire during the 1995–2000 and 2009–2010 ski seasons. Injury patterns by sport, demographics, and skill level were analyzed and compared over time.

Results.—The mean overall age was 32.9 ± 14.9 years, 35.4 ± 15.2 for skiers and 23.6 ± 9.5 for snowboarders ($P < .01$). The knee accounted for 43% of all skiing injuries, the shoulder 12%, and the thumb 8%. The wrist accounted for 18% of all snowboarding injuries, the shoulders 14%, and the ankle and knee each 13%. Beginner snowboarders were more likely to present with wrist injuries compared with intermediate ($P = .04$) and advanced snowboarders ($P < .01$). Demographic and injury patterns did not significantly change over time.

Conclusions.—At this mountainside clinic, the most frequent ski injuries are to the knee and shoulder, regardless of skill level. Beginning snowboarders most frequently injure their wrists whereas shoulder injuries remain frequent at all skill levels. Knowledge of these injury patterns may help manage patients who present for medical care in the prehospital setting as well as help in designing targeted educational tools for injury prevention.

Key words: skiing, snowboard, injury

Introduction

Alpine skiing was brought to North America from the Scandinavian countries during the mid-19th century and has grown in popularity to an estimated 11.2 million skiers in the United States as of 2010.[1] Snowboarding is a much newer sport that was invented in the 1970s by surfing and skateboarding enthusiasts. Snowboarding and skiing equipment, as well as style of riding, have tremendous differences. Unlike skiers, who face forward on 2 skis, carry poles, and have hard-shelled boots with releasable bindings, snowboarders are aligned sideways along a single board, do not carry poles, and typically have soft boots with nonreleasable bindings.[2] The inherent differences in the riding equipment and style have made for reported differences within the sports medicine literature in the demographics of injuries between skiers and snowboarders that are of significance to the prehospital care providers working at and responding to a ski resort.[1,2]

We sought to study the injury pattern for skiers and snowboarders at Big Sky ski area's mountainside clinic over several ski seasons and determine if the injury patterns changed 10 years later. Big Sky ski area is a destination ski resort in Montana within the northern Rocky Mountain range. The resort has a wide range of terrain, from beginner slopes to lift-serviced extreme terrain with cliffs, steeps, and tree skiing. Big Sky also offers a variety of terrain parks for all skill levels of snowboarders ranging from beginner to advanced, the latter of which include half-pipes and rails.[3]

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Methods

This study is an analysis of the patients seen at the Big Sky Medical Clinic, the sole medical clinic at the base of the mountain, during the ski seasons from 1995 to 2000 and a more recent cohort, using the same surveys, during the 2009–2010 season. The clinic sees almost all of the patients brought down by the ski patrol, as well as many walk-in patients. Before evaluations, the patients were asked to complete an injury survey that included but was not limited to information such as age, height, weight, physical condition, type of activity, skill level, equipment, boot type, run difficulty, snow conditions, injury location, time of injury, and method of transport to the clinic. The patients were then evaluated and treated by a physician blinded to the survey. Diagnoses was made by the clinic physician, and consultation requests received follow-up reports to ensure correct diagnoses.

The data for this study were directly based on the patient survey and on the clinical and radiographic evaluation and diagnosis. This information was entered into a computer database and cross-referenced with the official International Classification of Diseases, Ninth Revision (ICD-9), database from the clinic. All patients who answered the survey, provided the documentation was complete, and for whom an appropriate ICD-9 code was available, were included in the study. Patients who were severely injured and transported directly from the slopes to a higher level of care were excluded. The data were analyzed looking at injury location and prevalence for all patients, in skiers versus snowboarders, those surveyed 1995 to 2000 ("circa 2000") versus 2010, and for each self-reported skill level. A Student's t test, χ^2 test, and Fisher's exact test were used with an alpha $< .05$ for statistical significance. This study was approved by the Georgetown University Institutional Review Board.

Results

DEMOGRAPHICS

A total of 1662 patients filled out the questionnaire during the study period; 69 patients were excluded owing to incomplete diagnostic data, resulting in a total enrollment of 1593. Snowboarders represented 25% of the patient cohort. The total number of patients seen during the study period and the injury breakdown are shown in Table 1. Skiers tended to be older than snowboarders, with mean ages of 35.4 ± 15.2 and

Table 1. Demographics and injury location

Demographics	*Skiing*		*Snowboarding*	
Total injuries	1196		397	
Mean age, years	35.4 ± 15.2		23.6 ± 9.5	
Sex				
Male	48%		73%	
Female	52%		27%	
Body mass index	23.6 ± 4.5		22.7 ± 3.5	
Injury location	*1995–2000 (n = 1109)*	*2010 (n = 87)*	*1995–2000 (n = 332)*	*2010 (n = 65)*
Head	4.9%	4.6%	7.8%	0.0%
Face	2.8	0.0	2.7	1.5
Back	3.1	1.1	7.8	1.5
Shoulder	11.8	13.8	13.9	20.0
Arm	2.1	1.1	6.6	1.5
Wrist	3.3	5.7	18.4	20.0
Hand	1.5	2.3	1.5	9.2
Thumb	8.3	4.6	2.7	3.1
Other fingers	0.5	0.0	0.3	1.5
Clavicle	0.5	3.4	1.2	4.6
Hip	1.0	1.1	1.2	1.5
Elbow	0.4	2.3	2.1	9.2
Ribs	2.7	2.3	3.0	1.5
Leg	14.8	5.7	1.8	1.5
Knee	42.8	43.7	11.7	7.7
Ankle	3.6	8.0	13.3	3.1