BRIEF REPORT

Utah Ski Patrol: Assessing Training Types and Resources

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Background.—Skiers and snowboarders incur a variety of injuries and medical emergencies each year at ski resorts. The ski patrol is primarily responsible for initial triage, assessment and stabilization of these problems.

Objective.—The purpose of this study was to subjectively evaluate the type of training, resources, and equipment available to local ski patrols within Utah.

Methods.—Ski patrol directors at ski resorts in Utah were asked to complete a voluntary computerized survey.

Results.—Of the 14 ski areas in Utah, ski patrol directors representing 8 resorts responded. The majority of patrols in Utah use Outdoor Emergency Care (OEC) as their primary education and certification source. Most programs also include site-specific training in addition to basic certification. All responding resorts had basic first responder equipment, including splinting devices, basic airway management, and hemorrhage control. Six of 8 responding resorts had affiliated clinics, and all had access to aeromedical transport. All of the responding ski patrol directors believed the current training level was adequate.

Conclusions.—Utah area ski patrollers frequently see trauma-related injuries and have the resources to assess and provide initial immobilization techniques. Many resorts have affiliated clinics with advanced providers, and all have access to aeromedical support to rapidly transfer patients to trauma centers. Medical directors may be of use for training as well as developing extended scope of practice protocols for advanced airway use or medication administration. Patrols may benefit from additional resort-specific training that addresses other frequently seen injuries or illnesses.

Key words: skiing, snowboarding, ski patrol, Utah ski patrols, Outdoor Emergency Care, OEC, ski patrol training

Introduction

Skiers and snowboarders sustain a variety of traumatic and medical emergencies each year at ski resorts.^{1–4} Ski patrollers have a difficult job. They must evaluate patients who are heavily clothed in often cold and harsh environmental conditions. The decisions they make in these difficult situations can significantly affect the patient's outcome. Prior studies have found discrepancies and issues with proper training. Welch et al⁵ found an industry standard for wilderness first aid training does not yet exist and may contribute to some ski patrols being inadequately prepared for the injuries they encounter on the mountain. Kupper et al⁶ found that inadequate training resulted in the incorrect diagnosis in more than 10% of injuries treated by ski patrols. McCowen et al⁷ found that

ski patrollers often erred in the triage of adolescent and pediatric patients. When comparing injury patterns of ground vs air transport, they found that patients transported by air were more likely to have multiple injuries and also were more likely to be discharged home from the emergency department. They suggested that an “out-of hospital rule set” would be helpful in assisting first responders to identify patients who require advanced interventions and rapid transport provided by aeromedical transport. Despite these other findings, Usatch et al⁸ found that ski patrollers are receptive to training and able to retain knowledge from one ski season to the next.

The Outdoor Emergency Care (OEC) curriculum was developed by the National Ski Patrol in the 1980s. The curriculum is based on the US Department of Transportation's emergency medical technician (EMT) skills necessary for the nonurban environment.⁹ The OEC curriculum includes skills related to the outdoor environment as well as to illnesses and injuries

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associated with outdoor activities. Additionally, OEC includes training on packaging and transporting patients on snow, typically in toboggans. As a result, it has become the primary curriculum for the majority of ski patrols across the United States.⁹ (Specifics of the OEC curriculum can be found at www.nsp.org.)

There are other certifications in both prehospital emergency care and wilderness care. In the prehospital emergency care arena, there are the US Department of Transportation's emergency medical responder (EMR) and emergency medical technician (EMT) certifications. There is also a wilderness first responder course that is offered by a variety of wilderness education groups. An EMR is a certification designed to give trained persons the ability to provide simple, noninvasive interventions for sick or injured persons in the prehospital setting while awaiting additional EMS resources; the EMT training skills are focused on the management and transportation of these patients. The EMT training includes all skills of the EMR with additional skills to "minimize secondary injury and provide comfort to the patient and family while transporting the patient."¹⁰ The major difference between these training levels is the ability to provide medical transportation and to assist with or administer oxygen, aspirin, nitroglycerin, and in some cases, albuterol. The wilderness first responder certification is used by outdoor educators, guides, and search and rescue teams. It teaches the basic principles and skills required to assess and manage medical problems in extreme environments. It is a first responder certification similar to an EMR with a slightly different curriculum.

Understandably, ski patrollers are faced with significant challenges. They are evaluating fully clothed patients and are unable to expose them because of environmental conditions. However, the decisions they make on the ski slopes immediately after an injury can make a significant difference in the treatment and transport time to definitive care. The purpose of this study is to understand the types of ski patrol training in Utah, as well as the available resources on the various mountains and the injuries commonly seen at ski resorts, by surveying the directors of the 14 ski patrols in Utah. The information collected in these surveys was used to compare current training, medical direction, and equipment across various patrols in Utah and to determine whether the ski patrols would benefit from establishing an industry standard.

Methods

The 14 ski areas in Utah included in this study were identified using the Utah Ski and Snowboard Association website.¹¹ All ski patrol director contact information was obtained through a combination of information on ski resort websites, author contacts with ski patrols, and phone calls

to ski patrol offices and clinics. Each ski patrol director was contacted through e-mail with an initial invitation to take the survey, and then 2 further follow-up invitations by e-mail. The patrol directors responded voluntarily. Of the 14 ski area survey invitations, 11 surveys were filled out from 8 ski areas; 2 resorts had more than one person who responded. When applicable, numbers were averaged for each resort that had multiple responses.

Questions asked in the survey included patrol size, overall number of incidents, patrol make up (ie, volunteer vs professional), level of provider (OEC, EMT, registered nurse, physician assistant/advanced practice registered nurse, physician), available supplies (splints, advanced airway, medications), and proximity to onsite clinic, hospital, and air medical support. See the online [Supplementary Appendix](#) for survey sample.

The survey was administered using a computerized survey (SurveyMonkey.com, Palo Alto, CA). Results were collected and analyzed on an Excel spreadsheet (Microsoft, Redmond, WA). We used descriptive statistics in our analysis. The study was exempt from Institutional Review Board approval (45 CFR 46.101[b], Category 2).

Results

Of the 14 ski areas in Utah, 8 responded. Of these 8 areas, 1 was not a member of the National Ski Patrol. A list of the Utah ski areas and demographic data for the areas is given in Table 1.¹¹ The survey is included in the online [Supplementary Appendix](#).

DESCRIPTIVE STATISTICS

The mean number of paid full-time patrollers per area was 36, with a range of 6 to 85. The mean number of paid part-time patrollers on staff was 15, with a range of 5 to 40. Five resorts reported having volunteer patrollers; the mean number of volunteer patrollers was 50, with a range of 3 to 100.

TRAINING

The minimum level of training for hire required at all 8 areas was OEC. One resort also encouraged all paid patrollers to possess EMT certification. Seven of these 8 resorts had their own training in addition to either OEC or EMT. The specifics of this additional training were not supplied by the respondents. In addition to OEC, many resorts have patrollers with advanced levels of training. The level of training of the patrollers is presented in [Figure 1](#).

PHYSICIAN ROLE

Five of the 8 resorts had either paid or volunteer physicians as active patrollers. Six of the resorts had a

Table 1. Demographic data of Utah ski areas¹¹

<i>Ski area</i>	<i>Skiable acres</i>	<i>Vertical drop (feet)</i>	<i>No. of runs</i>	<i>No. of lifts</i>
Alta Ski Area	2200+	2020	116	8
Beaver Mountain	828+	1600	48	5
Brian Head	665+	1320	65	9
Brighton	1050+	1745	62	7
Canyons	4000+	3190	182	19
Deer Valley	2026+	3000	101	21
Eagle Point	600+	1500	39	5
Park City Mountain Resort	3300+	3100	116	19
Powder Mountain	7000+	2205	154	7
Snowbasin	3300+	2950	104	10
Snowbird	2500+	3240	94	12
Solitude	1200+	2047	65	8
Sundance	450+	2150	42	5
Wolfe Mountain	110+	1000	22	4

medical director, 2 did not. Medical directors in the 6 resorts were physicians. The specialties and responsibilities of the medical directors are presented in Table 2.

INCIDENTS AND ILLNESS

Seven of 8 resorts kept statistics regarding types of injuries and illness on the mountain. One did not keep records. Seven resorts reported specific numbers of incidents per season, often referred to as “10-50s” by

the ski patrol. An average of 5 helicopter evacuations were made per resort, ranging from 1 to 9, across 6 resorts for the season. Indications for helicopter evacuations included femur fractures, head trauma, and cardiac issues. One resort did not respond to this question, and 1 did not keep statistics. At all 7 resorts that kept statistics, orthopedic injuries were the most common, followed by head and spine injuries. Thoracic and abdominal traumas were the least common injuries reported.

Figure. Medical training of Utah ski patrollers (n = 663). OEC, Outdoor Emergency Care; EMT, emergency medical technician; PA/APRN, physician assistant/advanced practice registered nurse.

Table 2. Specialties of medical directors and their responsibilities at 6 Utah ski resorts

<i>Specialty of medical directors</i>	<i>No.</i>
Emergency medicine	1
Family practice	1
Pediatrics	2
Orthopedic surgeon	1
Intensivist (intensive care unit)	1
Responsibilities of the medical directors*	
Preseason medical training	6
Training guidelines	5
Protocols	5
Quality assurance/incident reviews	4

* Categories are not mutually exclusive; the medical director may have numerous responsibilities.

Six of the 8 responding resorts answered the question about the most frequent illness seen. Altitude illness was the most common medical illness seen at 5; 1 rarely saw any medical illness.

RESOURCES

Six of 8 resorts had a physician-staffed clinic associated with the mountain. None was affiliated with the ski patrol, meaning patrons of these clinics were subject to the same consent and payment (protocols) as an urgent care center. Patrons brought down on a sled, as well as walk-ins, were offered the resources of the clinics.

IMMOBILIZATION EQUIPMENT

Eight resorts responded to questions regarding available equipment. All 8 had backboards, cervical collars, and traction splints. Seven used box splints and had access to a scoop litter. Three resorts used vacuum splints for extremity injuries, and 1 used a ladder splint as an immobilization tool. Only 1 resort used a body immobilization device, usually called a vac mat or body beanbag immobilizer.

AIRWAY AND RESUSCITATION DEVICES

All 8 resorts had oxygen, nasopharyngeal airways, and manual suction available; of these, 7 also had an oral-pharyngeal airway. Two resorts utilized supraglottic airways (Combitube or King systems airways), and 4 had advanced airway capacity with laryngoscopes and endotracheal tubes. With regard to resuscitation equipment, 7 of the 8 responding resorts had an automatic external defibrillator available on the mountain. Additionally, 3 of the resorts had cardiac monitors. One resort reported having available equipment but stated that experienced people are not always available to place that equipment.

MEDICATIONS

Of the 8 responding resorts, glucose was available at 5, EpiPen and intravenous fluids were available at 4, and nebulizer machines for treating asthma, advanced cardiac life support medications, Benadryl, and aspirin were available at 3 resorts. Inhalers, Ibuprofen, Tylenol, and steroids were available at 2 or fewer resorts. Table 3 lists the medications available at participating Utah ski resorts.

HEMORRHAGE CONTROL EQUIPMENT

All responding resorts had gauze and pressure dressings, and 5 of 8 had tourniquets available.

OPINION OF TRAINING

All 8 of the responding patrol directors believed training of patrollers was adequate for the illnesses and injuries commonly seen. Four of the patrol directors would like to see additional training in rope rescue, special considerations for adaptive customers (patrons with disabilities), on-hill scenarios, and toboggan training. Time and expense, however, are limitations to additional training.

Discussion

The ski areas in Utah are all quite different. The composition of the patrols varied widely across the state, with many resorts having patrollers with advanced certifications. All responding resorts were consistent, however, in requiring OEC as a minimum level of training. Across all responding resorts, orthopedic injuries were most common. The OEC curriculum teaches responders to evaluate, stabilize, and transport victims of trauma. Basic concepts of fracture assessment and management are included in the

Table 3. Medications available at Utah ski resorts

<i>Medication</i>	<i>No. of resorts</i>
Aspirin	3
Tylenol	1
Ibuprofen	2
Benadryl	3
Steroids	1
EpiPen	4
Glucose	5
ACLS drugs	3
Inhaler	2
Nebulizers	3
Intravenous fluid	4

ACLS, advanced cardiac life support.

curriculum. Therefore, the principles taught in OEC are applicable to the majority of injuries encountered by ski patrollers.

Many ski patrols are associated with a ski clinic and have advanced providers available. These providers are different from the advanced providers on the patrol staff. Although the majority of ski areas are 15 to 20 miles from the closest emergency department, Utah has an active air medical system with several aeromedical providers close to the Utah resorts. As a result, a critically injured or ill patient can be quickly transported to definitive care by air transport despite the longer distance to hospitals.

Medical directors are typically responsible for assisting in medical training, direct or indirect medical control, and helping to make standardized protocols and assist with quality assurance. Direct medical oversight is real-time contact with a physician who helps direct patient care. Indirect oversight does not require direct voice contact with a physician, but allows prehospital providers to initiate critical treatment such as oxygen administration or life-saving medications based on written protocols. Both direct and indirect medical oversight rely on protocols.⁹ Although it is not mandatory that all ski patrols have a medical director, according to the OEC textbook, "a licensed physician must assume legal responsibility for a patient's care throughout an emergency, from the time an emergency medical responder begins care through discharge from the emergency care system."⁹ That implies that all patrols following the OEC curriculum should have some type of physician medical director. Of the responding patrols, most, but not all, did have medical directors.

Backboards, cervical collars, and traction splints were universal at all the responding ski resorts. That is in accordance with the recommendations of OEC, given that applying a cervical collar, spine immobilization on a long board, and traction splinting are all required skills for an OEC provider. Most resorts also had a box splint, useful for lower extremity immobilization—another skill required by the OEC. Other immobilization devices that may assist in rapid immobilization and transport off the hill are used at some areas.

Comparable to the universal presence of backboards, cervical collars, and traction splints, all resorts had airways adjuncts such as oropharyngeal and nasopharyngeal airways in accordance with required OEC skills. The availability of manual suction devices on the hill in some resorts may assist in clearing an airway and help a responder insert an airway device. Advanced airways such as supraglottic devices and endotracheal tubes may be useful for an appropriately trained and experienced provider. These skills are not included in EMT or OEC

curriculums and require an advanced practitioner. Additionally, the medical director could implement an extended scope of practice protocol for using these devices. Many of the responding resorts had personnel capable of advanced airway management.

Similarly, some resorts reported having the ability to place intravenous lines and having cardiac monitors either through the associated clinic or on patrol when they have the appropriate advanced providers. However, there was significant variability among the resorts as to what type of airway and resuscitation equipment was available. As with advanced airways, these interventions and monitoring systems are useful only if there is a qualified provider on scene, or if basic protocols and adequate training are in place. Automatic external defibrillators, however, are devices developed for use by the general public to aid in early defibrillation in cardiac arrests and have been widely reported to improve survival.¹² All resorts should have these on hand. Most of the responding resorts had an automatic external defibrillator available, but 1 did not have it on site.

Medication availability and use varied widely among resorts. Providing any medication beyond over-the-counter drugs warrants prescribing, and thus requires a provider trained in administration and a medical director to assume liability. Epinephrine is a life-saving medication for anaphylactic shock. In Utah, state law maintains that persons "who have responsibility or reasonably expect to have responsibility for at least one other person as a result of the person's occupational or volunteer status" are allowed to administer epinephrine in an auto-injector such as an EpiPen if they have completed a training program.¹³ In other states, physicians are not allowed to write prescriptions to a group or organization for use on a third party unless they are the medical director and have designated protocols for use. Given the amount of variability in both the airway and resuscitation equipment and medications available, it would be useful for recommendations to be given by a governing body (eg, National Ski Patrol, American Medical Association). Additionally, a medical director can assist in developing and instituting protocols and training for resuscitation adjuncts and medication administration.

Given the availability of additional medical resources, such as on-site clinics and rapid transport to advanced hospital care, the patrol directors surveyed believed that OEC was adequate training for the scope of injuries and illnesses seen in ski areas.

Prior studies have looked at the OEC protocol in comparison to traditional EMS training.¹⁴ Constance et al¹⁴ compared the curriculums of OEC and EMT.

They found that OEC exceeded the requirements of an EMT but did not include all the skills and knowledge of an EMT. The EMT curriculum adds skills necessary for transportation, which includes simple medication administration. Additionally, OEC “prepares out of hospital providers to care for patients in the wilderness, with special emphasis on snow sports pathology.”¹⁴ We sought to look at the available resources and equipment available to patrols in light of the incidents and illnesses seen. Although we did not directly study the adequacy of OEC training, we did ask the opinion of the patrol directors about OEC training.

Perhaps the addition of a skill set in addition to the OEC curriculum regarding medication administration would assist patrollers in administering medications, thus making the available medications more uniform. That likely would have to be done with the guidance of a medical director. However, OEC training is still of utmost importance as it is training focused on the delivery of care in the wilderness, especially in snow sports, according to Constance et al.¹⁴ There is room for further study comparing OEC and WEMT, and that may be helpful to determine whether training beyond OEC is warranted.

STUDY LIMITATIONS

In surveying the ski patrol directors of Utah ski areas, we were only able to obtain information about 8 of the ski resorts. Being just over half, that may not be representative of all Utah resorts. There was also significant variability in record keeping. The extent of statistics regarding injuries and incidents was variable. Therefore, the analysis could be influenced by reporting bias. To determine whether current training is accurate for the injuries and incidents seen, more uniform reporting of statistics would be useful. The survey sample was affected by a nonresponse bias in that some patrol directors did not respond, making the sample size smaller. There could also be response bias as resorts may want to present themselves in a more favorable way and may be reticent about divulging undesirable statistics or information.

Conclusion

The goal of this study was to assess the types of training and resources of Utah area ski patrols. All of the responding resorts required OEC as a minimal level of training. The OEC is already a national curriculum and is widely accepted as the standard for ski patrol training. The majority of ski patrol patient encounters are trauma-related injuries, and the current level of training provides patrollers with the resources to assess

and initially stabilize these injuries. There are numerous advanced skills and equipment such as airway devices, intravenous lines, and medications that could be beneficial if there are advanced providers available on hill, with adequate training and appropriate medical direction. Many resorts have affiliated clinics with advanced providers, and all have access to aeromedical support to rapidly transfer patients to trauma centers. Resorts may want to consider individual additional training curricula based on the needs of that particular resort and on the incidence of more complex patient encounters.

Supplementary Data

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.wem.2014.06.004>.

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