AN ANALYSIS OF AVALANCHE ACCIDENT CAUSES: SKI AREA PROFESSIONAL PATROL

Alex Bergeron¹*, Jerry Johnson², Jordy Hendrikx³

¹Montana State University, Health Sciences, MT USA
²Montana State University, Snow and Avalanche Laboratory, MT USA
³Montana State University, Political Science, MT USA

ABSTRACT: Professional ski patrollers working in areas of high avalanche hazard terrain are responsible for ensuring safe conditions for the recreationally skiing customers within the boundaries of their particular ski areas. In order to do so, mitigation teams employ a variety of techniques such as deployment of explosives of various types and ski cutting on slopes with potential avalanche hazard. These mitigation techniques expose patrollers to the risk of injury and/or death. Analysis of survey data from 151 patrollers reveals that 80% stated that they have “had an avalanche related accident or near miss on the job”. The primary causes and just as importantly non causes are reported, qualitative statements illustrating accident causes are explored and, suggestions are presented aimed at accident prevention.

1. INTRODUCTION

The avalanche mitigation skills of the ski area professional patroller (pro patrol) are called on after storm events and prior to opening particular areas to skiing public. Given the high risk setting in which pro patrols operate, on the job accidents are recognized as potential outcomes and injury or death are real day-to-day possibilities. In an effort to understand the nature and cause of accidents in the workplace, a survey of almost 500 avalanche professionals was conducted. Of those surveyed, 151 self identified as ski area professional patrol.

The survey addressed three general categories of the workplace: demographics, organizational setting, and accidents. The approach taken was to first understand the demographics of the pro patrol, then to examine the institutional setting in which they work, and third to understand potential contributors to understanding workplace accidents. The examination of such relationships is common in studies of workplace safety (Guldenmund 2000). The conceptual framework for this study follows Geller (1994:18–19) who identifies three “dynamic and interactive factors” to a safety culture. The three are: the person and his knowledge, skills, abilities, intelligence, motives, and personality; organizational behavior operationalized as compliance, coaching, communicating and caring; and environmental factors such as infrastructure, weather, and tools.

2. DATA AND METHODS

A survey was developed aimed at describing the demographics, organizational culture, and causes of accidents for a wide variety of the professional avalanche and snow science community. Survey development followed a three-part process. First, the initial survey was designed based on similar work in the industrial safety literature and standard demographic surveys. Second, it was subjected to testing and comment at the International Snow Science Workshop in 2012 by members of the avalanche education and research community. Approximately 35 respondents provided input on the survey. Third, the revised survey was sent out to a panel of expert reviewers for further input.

We employed a modified convenience sample, as there is no single professional organization of the potential respondent pool. Rather, the final survey was administered electronically to multiple international organizations including professional ski patrols, several professional avalanche education organizations, ski and mountain guide certification programs, membership listserves or electronic newsletters, and personal contact lists. There is no way to know the total population of potential respondents and no doubt some received multiple requests for completing the survey. As such, it is impossible to determine a response rate for the survey. The survey was posted for several months between September 2012 and February 2013 in order to provide ample time for dissemination and completion. We also encouraged respondents to send a link forward via their personal contacts (i.e. snowball sampling) The relatively long duration for administration was also required in order to capture the winter season in both the northern
and southern hemispheres and to allow ample time for seasonal workers to respond to requests.

3. RESULTS

The survey consisted of 37 questions and required approximately 15 - 20 minutes for completion. No IP addresses were collected; the survey was confidential and anonymous. Responses were elicited via an email notification from one of the sources referenced above and linked to the survey via a direct hyperlink. We received 487 responses. Most (>95%) were from North America. Of those respondents, 31% self identified as ski area professional patrol. The data obtained from the pro patrol component of the survey is presented in this manuscript.

3.1.1 Demographics of pro patrol
Demographically, most respondents (>90%) are male. The average age is 42 years, over half are married, over a third have children, almost half have a Bachelor’s degree and over half of those possess either a math or a science degree. The average number of days worked is 75 (roughly full time for a complete winter season). The number of years worked as pro patrol range from less than 1 to 50 giving an average length above 14 years.

3.1.2 Pro patrol's perception of professional competency and personal risk
Over 87% of pro patrol respondents report their initial training as being comprised primarily on the job and 35% state that their initial training lasted for more than one year. Over 90% reported that each day they are always or almost always prepared for the worst case scenario and plan accordingly. Roughly 37% responded that they never take short cuts that may potentially compromise the personal safety or the safety of coworkers or clients and over 53% responded that they rarely take such short cuts. Combined, about 97% either agreed or strongly agreed that they have the snow and avalanche knowledge to be safe and effective in the field. Over 85% either somewhat agreed or strongly agreed that they have adequate knowledge of human behavior to be safe and effective in the field. Finally, over 97% agreed strongly or somewhat agreed that they have good decision making skills when it comes to being safe at their job.

3.2.1 Organizational setting of ski area professional patrol
Organizational setting can be defined as the culture surrounding the way things are done in an institutional setting. These include processes, structures, communications, and control. Culture takes on many forms – from highly structured

3.2.2 Pro patrol's perception of organizational culture

The survey showed that almost 50% of respondents work for organizations that employ over 20 avalanche professionals. Over 85% of these organizations have been in existence for over 30 years and almost 90% are privately owned. Combined, over 60% of pro patrols either agreed or strongly agreed that their employer has provided them with a formal best practices statement or policy for their job as an avalanche professional, and combined almost 70% either agreed or strongly agreed that they understand the best practices procedures as defined by their employer for their job as an avalanche professionals. Over 50% of pro patrols either agreed or strongly agreed that their organization has provided them with opportunities to receive the highest level of training possible given their positions and years on the job. In these pro patrol organizations, avalanche meetings/briefings are conducted daily, before each shift in over 60% of organizations and daily, before and after each shift in over 25% of organizations. Combined, over 90% reported that communication with their organization was open and easy either always or most of the time.

3.3.1 Potential contributors to pro patrol on the job avalanche accidents
Over 80% of pro patrols answered that they have had an avalanche related accident or near miss on the job. Of the pro patrols that were involved in an avalanche related near miss, incident, or accident, over 75% claimed that they themselves were the most responsible for the event. The three most important contributors to on the job avalanche accidents reported as: Poor personal decision making, pre assumptions (decisions based on past data or experience), and loss of situational awareness.

3.3.2 Non contributors to pro patrol on the job avalanche accidents

Over 70% are always confident that when they see a dangerous situation, they can ask operations to stop and reassess. Over 70%
always understand exactly what they are trying to do or expected to accomplish when they start a control mission. When rating the three most important contributors to on the job near misses and accidents, the three identified as the least important contributors were: Bad luck, competitiveness with others, and sense of responsibility (to the profession).

4. CONCLUSION

In this manuscript, a survey of professional avalanche community was used to obtain and present data on the demographics, organizational setting, and accidents involving ski area professional patrol. The data shows that the profession has the capacity and skills to adapt and could use examples from other high risk industries to do so. Institutional procedures seem to be in place that help prevent accidents; there seem to be few if any organizational causes. Rather, respondents take personal responsibility for accidents that happen on the job. The culture of learning from error seems robust. It is therefore suggested that an institutional infrastructure be constructed that would facilitate a learning from error culture for the community as a whole. Further research is needed to adapt and validate existing industrial principles and methods to the ski area professional patrol community.

5. REFERENCES

