ABSTRACT: It is essential that avalanche forecasters and guides accurately recall and apply the details of past avalanche events. The operational capability to accurately report events and summarize event variability related to storm cycles and/or snowpack structure over terrain is limited. In the absence of a sophisticated method of computer modeling, most operations rely on "local knowledge," or what may be referred to as an operation's "working memory." Rarely are near-misses and accidents unexpected and without warning. As lead guide and forecaster, I believe that operations do repeat errors. Constructing a functional operational working memory is an essential component to minimizing risk and exposure in the field. At Ruby Mountain Helicopter Skiing (RMH), staff incorporates the operation's working memory into the daily guide meeting by projecting an avalanche run photo catalogue that all guides can visualize. During this meeting the operation's working memory is communicated among guides. In particular, past near-misses and slopes that tend to produce repeater avalanches are highlighted and strategies are implemented to avoid those risks.

This approach has been shown to reduce avalanche incidents. Since implementation and refinement of this type of structured guide meeting, there have been no clients or guides at Ruby Mountain Helicopter Skiing involved in a D2 or greater avalanche incident. The empirical conclusions suggest that risk in the field has been reduced and guide-to-guide communication has improved by utilizing this framework for the morning and evening guide meetings.

KEYWORDS: Communication, risk management, working memory, guide

1. INTRODUCTION

As the lead guide at Ruby Mountain Helicopter Skiing (RMH), the intent behind this paper is to share information that has helped reduce avalanche risk and improve guide-to-guide communication. Like many professions, mechanized ski guiding has continued to evolve and change over the course of its history. Considering the changes that this niche field is experiencing, it is important to establish a professional and accurate way to communicate information as it relates to avalanche hazard and risk management.

Historically speaking, avalanche accidents and incidents typically re-occur on the same slopes. For example, in the past ten years there have been four separate avalanche fatalities on Gobblers Knob in the Utah's Wasatch Range. (Utah Avalanche Center Data Base, 2016). This avalanche path has had more independent fatalities than any other slope in the range. In the Pacific Northwest there have been three separate accidents over three years on Granite Peak, near Snoqualmie Pass, resulting in three fatalities (Northwest Avalanche Center Data Base, 2016). This data helps confirm that near misses and accidents do repeat themselves. It is imperative that this information is communicated to guides, forecasters, professionals and recreational users involved in the winter backcountry environment. Considering that there are currently no advanced methods for categorizing this information, we must rely on communicating this knowledge. In other words, operations must pass on their local knowledge or "working memory" from guide to guide or professional to professional. This is becoming especially important due to generational shifts in the industry as the pioneers within the community retire and pass on the reigns to the millennial generation.

While seemingly simple, communication is a complex process involving multiple people expressing ideas and receiving information (Atkins, 2008). According to the Merriam-Webster (2016) dictionary communication is, "the act or process of using
words, sounds, signs or behaviors to express or exchange information or to express your ideas, thoughts, feelings, etc., to someone else.” It is a “transaction” of sorts between a sender and receiver (Townsend, 2009). Effective communication is an essential skill for not only winter backcountry users but also for many other complex organizational careers including the medical, airline and firefighting industries (Zweifel, 2014). At RMH, our communication among guides has evolved to include visual aids, an on-line guide database and an interactive morning and evening guide meeting with guidelines regarding professional behavior and conduct. This is in line with Adams's research from the 2005 paper citing that "open communication resulted in improved judgment and decision actions."

This paper will discuss a case study from a near miss at RMH and delve into further discussion regarding the strategies implemented to reduce these types of events particularly focusing on communicating the operation’s working memory among team members.

2. CASE STUDY

On February 14, 2013 RMH was operating a single day skiing trip with 12 skiers. That morning RMH had a guide meeting with all guides and snow safety team members. All guests attended an orientation and safety briefing before starting the day of skiing and riding. At 10:35 one group of skiers and one guide were involved in a class three avalanche on a ski run named “Cherry”.

Three days earlier, on February 11, Cherry had one cycle of 16 skiers and 4 guides on it. Explosive work was also conducted on this slope on both February 11 and February 1 with no results. There was no new snow, no significant wind, and no rapid weather or temperature changes since February 11.

Guide A started the circuit that morning in Thorpe Creek drainage, skiing Cherry at 10:05, starting approximately 15 meters to the skiers right of the ski tracks created on February 11. Guide B, leading group two, skied 20 meters to the right of Guide A’s tracks. Guide C, leading the third group, met up with Guide B’s group at the top of Cherry after Guide A’s group had finished the run.

Guide B’s group began next, with Guide B skiing the slope first, followed by his skiers one at a time. The third rider in Group B started down and disappeared over a convex roll. Moments later, this individual triggered a large slab avalanche (SS-AS-D3-G-BR) approximately 50 meters downhill from where he entered the ski run.

Guide C immediately communicated to all the riders/skiers remaining at the top of the slope to stay at their location on the ridge top while he conducted an avalanche rescue initial response search. At the same time, Guides A and B informed Ruby Base of the incident and emergency protocol was put into action. The rider caught in the slide was partially buried and had no injuries.

The guides completed a fracture-profile analysis and the incident was heavily debriefed among guide staff and guests.

3. DISCUSSION

RMH has been one of the leading helicopter ski operations since 1977 and continually updates safety strategies as research and experience become available. While the incident on Cherry clearly motivated the guide staff and owners to initiate some changes, RMH was already in the process of re-vamping communication strategies long before this incident.

The morning and evening guide meeting was an established protocol well before this incident. It is during this meeting that guides can discuss possible hazards and how risk might be managed. It is also a time that experienced guide staff can communicate their knowledge to newer staff. Owner and founder, Joe Royer has nearly forty years experience managing RMH and guiding in the Ruby Mountains. Joe has many distinct memories of terrain hazard and risk management strategies as it relates to the Ruby Mountains. His experience and working memory from guiding in the area helps his ability to forecast specific locations on slopes that are prone to avalanche. During morning guide meetings, Joe will discuss possible avalanche paths that he has seen avalanche in the past and communicate these risks to the newer guide staff by pointing out key “landmark” and terrain features on a projected image on a large screen with a laser pointer.

Since the Cherry incident, RMH opted to implement more structure to the guide meeting. We created a set of guidelines and rules for our guide
meetings concerning meeting etiquette and communication. One of the most important rules involves limiting distractions and interruptions. Participation is also highly stressed and if a guide is not at the meeting they cannot guide that day. Guides are required to engage in the meeting and are aware that any guide, regardless of experience, has the power to veto a run. Cell phones are off and we only interrupt the meeting if a guest has a pressing need.

One of the most formative changes after the incident resulted in consistently projecting a detailed and organized run-list on a large screen for all guide staff to visualize. Recognizing that communication does not only include verbal information, the visual aids have broadened RMH’s capacity for communication. The first item our guide staff sees on the screen is a color-coded document including weather observations, forecasted weather, avalanche problems, field strategies and guide assignments. The guide serving as forecaster for the day summarizes the form, and as a team, avalanche and non-avalanche hazards are discussed. The run list is projected next, categorized by ‘Regular’, ‘Intermittent’, and ‘Occasional,’ referring to how often the terrain is used for the operation.

This run photo database that is projected includes all known runs and various photos of the terrain. The photo database includes both pictures of the runs with ski tracks and avalanche activity in the run or within the vicinity. When these photos are projected, senior guide team members are able to share their working memory to the newer staff by pointing out hazards and risks on the photos with a laser pointer. Runs are given a rating based on the current avalanche forecast. Green runs are open for guiding. Red runs are closed for guiding and re-evaluated in 24 hours. Yellow runs are runs that are possibly open for guiding upon more assessment and if specific conditions are met. To change a Yellow run to Green, guides must meet in person and have a unanimous decision about opening the run. Black runs are closed for a non-avalanche hazard for example a creek crossing or firm snow conditions. Designated blank runs have not been evaluated and have not been considered for opening, therefore are not discussed.

Canadian Mountain Holidays (CMH) manages and codes their terrain in a similar fashion (Atkins, 2004). In this way, both RMH and CMH have utilized an effective communication tool that has promoted success and safety.

As previously stated, accidents do repeat themselves, so it is imperative that an operation’s working memory is effectively communicated among guides. Working memory is a complex neuropsychological concept that refers to the ability to retain information, while utilizing this information to make decisions and carry out a plan (Cowan, 2008). It is not necessarily short-term memory but incorporates aspects of short-term memory as it relates to, “learning, planning and reasoning” (Postle, 2006). Learning, planning and reasoning are important components to ski guiding and the guide meeting is an ideal environment to communicate this information, ultimately, minimizing risk in the field to guides and clients.

It is well documented that an environment that supports open communication is more likely to be safe and successful. There is substantial research that strongly suggests effective communication within large institutions promotes financial growth and reduces employee turnover among many other advantages (Yates, 2006). Similarly, poor communication has been cited as a cause of avalanche accidents (Atkins, 2004). In the medical field, it is well known that, “safety . . . is dependent on teamwork, communication and a collaborative work environment” (The Joint Commission, 2008). Considering that the winter backcountry environment has many similarities to aspects of the medical field such as working in teams and managing risks, it is reasonable to relate this research to the snow sports industry.

Accidents typically occur either from catastrophic events or develop after a number of seemingly harmless decision are made. Sometimes these harmless decisions do not lead to accidents as the nature of ski guiding doesn’t necessarily lend itself to an obvious feedback loop (Stewart, Patterson, 2008). In the case of the Cherry incident, there were a number of small miscommunications among guides that resulted in a near miss. In particular, Guide B did not have a good overall view and vision of the ski runs he was going to be guiding for the day. At the time, a run photo was not available of Cherry and so, it was not projected on the screen during the morning guide meeting. While not the sole factor, this lack of communication likely contributed to the incident on Cherry.

Since implementing these changes to our communication strategy and guide meeting, there have been no clients or guides at RMH involved in a D2 or greater avalanche incident. While not conclusive evidence, these empirical observations sug-
suggest that risk has been reduced and communication has improved.

4. CONCLUSION

Communication, working memory, and risk management are inherently difficult topics to concretely study. More so in a field like ski guiding where there is a strong individualistic component and decision-making is innately complex and often intuitive in nature (Stewart-Patterson, 2008). Other fields, such as the medical field, have abundant research related to communication and teamwork that can be particularly relevant to the winter backcountry environment. In this paper, the goal was to relate this research to the snow sports industry, while also sharing strategies that have been used at RMH to effectively communicate the operations working memory and subsequently minimize risk.

To summarize, it is important to communicate an operation’s working memory because research shows that near misses and accidents do repeat themselves. At RMH, effective communication begins at the morning guide meeting, continues throughout the day and ends at the evening guide meeting. A variety of communication strategies are used including visual aids and other tools to increase participation and awareness and ultimately lower client and guide risk.

It would be beneficial to undergo a qualitative study that more directly assesses communication as it relates to risk management in the winter backcountry environment. Additionally, the industry could benefit from some sort of systematic method that categorizes information as it relates to risk. This information could be presented in an organized manner that is easily accessible to the professionals and recreationalists involved in the winter backcountry environment. Until research suggests otherwise, RMH will continue to utilize a multi-factorial approach towards communication knowing that the experiential conclusions all point towards a reduction in avalanche accidents.

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