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A Qualitative Study of Psychological Outcomes in Avalanche First Responders

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Abstract

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Objectives: We sought to characterize the mental health morbidity associated with avalanche rescue, and to generate hypotheses as to how such morbidity may be mitigated.

Materials and Methods: Avalanche first responders were recruited through online advertisements, social media, direct outreach, and e-mail solicitation. Thirteen subjects were selected for inclusion. Each subject participated in a semistructured interview. Transcripts were coded and thematically analyzed.

Results: Themes identified from interviews fell into three broad categories: long-term effects of rescue participation, assessments of psychological support, and recommendations for change. Symptoms of substance use disorder, depression, anxiety, panic, acute stress disorder, and posttraumatic stress disorder were evident in the interviews, as was evidence of adverse effects on subjects' personal relationships. Many respondents described a deficiency of formal psychological support for avalanche first responders, often limited to after-action debriefs of varying effectiveness. Nevertheless, subjects who received high-quality professional psychological support considered it helpful. Participants' suggestions for improvement focused on formalizing preincident psychological preparation and postincident support.

Conclusions: Avalanche responders may experience long-lasting, work-related psychological effects. There is a paucity of effective psychological preparation and support for this population of first responders. Formal psychological support is positively received when available. Further study is required to evaluate particular interventions in this specific population.

Keywords: avalanches; mental health; rescue work

Introduction

Disaster first responders demonstrate an increased potential for psychological effects such as acute stress, posttraumatic stress disorder (PTSD), and substance use disorders (Alexander and Klein, 2009). Individuals involved in backcountry incidents like avalanches constitute an important subset of this population. Professional avalanche first responders are exposed to the morbidity and mortality of avalanche events with relative frequency.

Recent years have heralded an emerging awareness of the vulnerability of ski town communities to mental illness. Mental health providers have attributed this phenomenon to a culture of rugged individualism, ready access to firearms, and lack of mental healthcare in mountain communities. Moreover, social factors in these communities—including profound wealth disparity, lack of social cohesion due to transient populations, unreliable seasonal employment, and substance use—serve to exacerbate the issue (McMillan, 2016). Many avalanche rescue personnel are likely to live and work in vulnerable communities like these.

We hoped to learn more about the effects of avalanche rescue work on first responders in the prehospital setting. Adverse psychological effects in other first responders such as paramedics (Roden-Foreman et al., 2017), firefighters (Jahnke et al., 2016), police officers (Marmar et al., 2006), and responders to terrorist events (Wesemann et al., 2018) are well documented. Several studies have demonstrated that rates of PTSD and acute stress disorder are higher in search and rescue and disaster response workers, such as canine handlers, emergency medical technicians, and firefighters (Benedek et al., 2007). Few studies specifically pertain to

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avalanche rescuers (in particular, ski patrollers and search and rescue workers). Yet, this group interfaces with one of the most dramatic types of trauma with some regularity. One prior investigation of professional and volunteer rescue workers in avalanche conditions found that volunteer responders experience PTSD symptoms more often than professionals (Haraldsdottir et al., 2014).

It is difficult to estimate the prevalence of psychopathology among avalanche rescue workers, in large part, due to the apparent rarity of formal diagnoses. Rural areas, where many backcountry first responders are apt to live, have a greater likelihood of shortages of mental health professionals like psychiatrists and psychologists and, as such, less access to relevant care (National Advisory Committee on Rural Health and Human Services, 2004).

This study aims to describe the psychological burden in prehospital avalanche responders, with a view to elucidating how such individuals might be more effectively psychologically prepared and supported preincident and postincident.

Materials and Methods

Individuals who had directly participated in one or more avalanche rescue events were recruited through online advertisements, outreach to mountain rescue organizations, solicitation through e-mail, social media, and personal communication to backcountry ski communities in Wyoming, Utah, and Colorado. Interviews with individual subjects often led to referrals to subsequent potential participants. Inclusion required personal involvement in avalanche first response human rescue within the past 10 years. No exclusion criteria were used. Numerical identifiers were assigned to study subjects to protect confidentiality, and the confidential nature of the study was explained to subjects. Thirty potential subjects were identified, 18 expressed willingness to participate, and 13 ultimately completed the full interview. All willing and qualified subjects were interviewed, and each was interviewed only once. Of the five who did not ultimately participate, one was unable to due to unanticipated health problems and four were unavailable due to scheduling conflicts.

Semistructured interviews were conducted with each subject; each typically lasted 20–40 minutes. One investigator (N.D.) conducted all interviews to maintain consistency, and interviews were conducted through telephone due to the wide geographic distribution of subjects. Questions were generalized and pluralized for subjects who had experienced multiple avalanche rescues. Digital voice-recordings were created and thereafter assigned a numerical identifier.

After data collection, verbatim transcripts of each interview were created and analyzed. Demographic data were collected and reported in aggregate. Qualitative data were analyzed using NVivo software (QSR International, Burlington, MA). A grounded-theory approach (Choo et al., 2015) was used to analyze and code transcripts, based on themes related to the study questions as well as topics that arose *de novo* during the interview process. Both authors reached consensus on assigned codes and themes.

The study was approved by the Institutional Review Board of Columbia University Medical Center.

Results

The demographic characteristics of participants are shown in Table 1. The majority of participants were 25–44 years old

Table 1. Demographic Characteristics of Participants

Variable	n = *13,* n *(%)*
Age, years	
25–34	2 (15)
35–44	7 (54)
45–54	4 (31)
Gender	
Male	12 (92)
Female	1 (8)
Role	
Professional	8 (62)
Layperson	1 (8)
Both	4 (31)
Rescuer role	
Alone	1 (8)
Part of group	11 (84)
Both[a]	1 (8)

[a]Experienced multiple avalanche events with different characteristics.

(54%), were male (92%), and had experience in professional mountain rescue (93%). All subjects had basic medical training, but there was a wide range of avalanche rescue training experience (Fig. 1).

Coding and analysis identified three broad categories pertaining to avalanche rescue: long-term effects, impact of psychological support, and improvement recommendations.

Subjects reported many psychological, personal, and professional effects of avalanche rescue (Table 2), including a wide range of mental health effects. Representative responses included the following:

- "I can only explain this in an analogy—I teach prehospital medicine and if I talk about a particular incident or situation I can bring gravity to a situation by adding emotion to it. When I do that once it's powerful, when I can't hold it together a second time it's like 'ah that poor guy,' but when it happens a third time it's like 'can somebody get that guy some help because this is really uncomfortable?'"
- "I'll go back to the lack of sleep or the difficulty in sleeping. I refer to it as 'the movie plays on' where you get the privilege of experiencing that event over and over again, and then the awesome experience of having a different event trigger the same hormonal release and then you get to experience the same event again. I laugh when people talk about the avoidance of trauma-related thoughts—you can't get them out of your head."
- "I had to find that discipline to be able to have fun again, meaning to be able to go out into the mountains with my friends and be able to have a very good time. At one point in my life, I was having difficulty doing the things that I enjoy the most because of what I experienced in that environment; I was going out there and I would be like, 'OK, so am I going to see dead out here today?'"

The interview was not structured to determine whether participants met formal diagnostic criteria for any particular psychiatric disorder. Nonetheless, subjects often revealed symptoms such as panic, anxiety, and depression, as well as components of PTSD (American Psychiatric Association,

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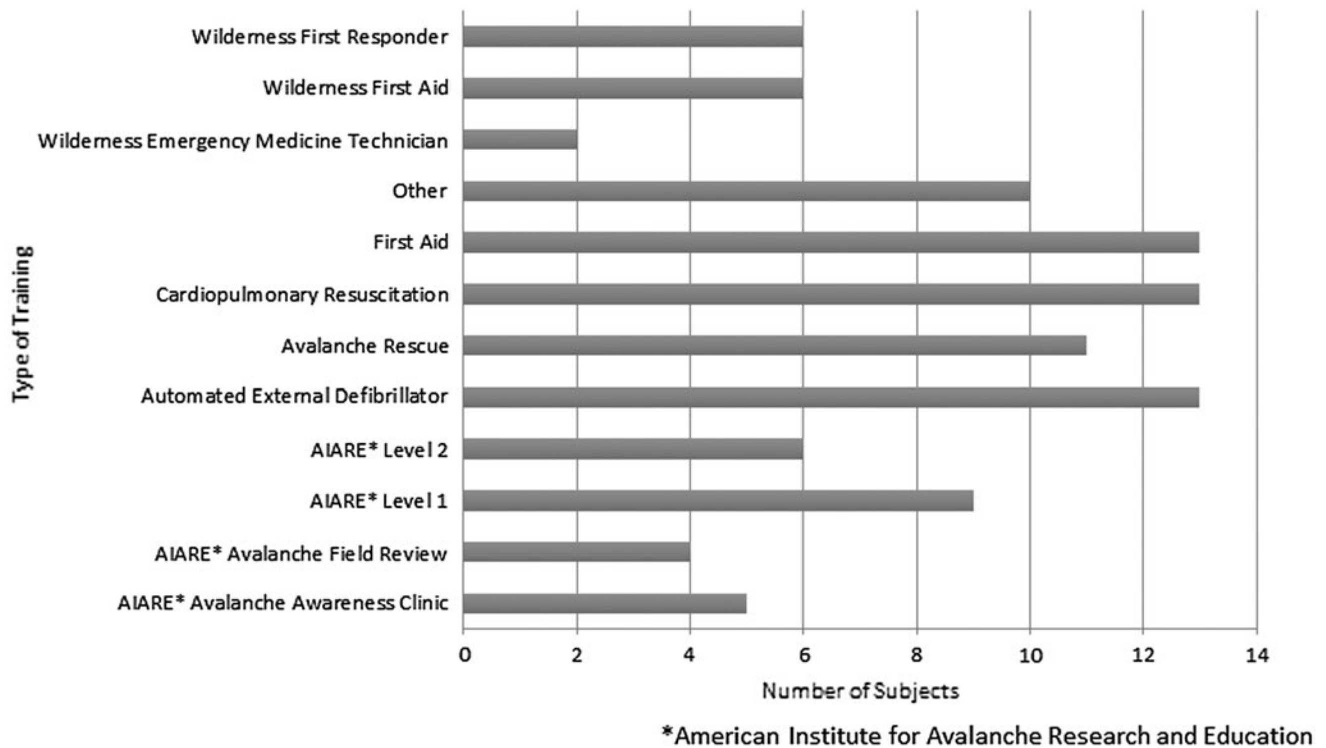

FIG. 1. Formal training experience of avalanche first responders.

2013). The use of alcohol to self-medicate and facilitate conversation about rescue missions was prevalent among participants. Percentages of total respondents who exhibited specific mental health symptoms are shown in Figure 2.

Symptoms often persisted on the order of years. Many described long-lasting negative effects of rescue experiences:

- ''I'm five years out and I'm still talking about stuff.''
- ''A couple of weeks, as far as I know. But since I've given up alcohol, I think they've probably lasted a couple of years, but were just never dealt with....''

In their personal lives, subjects reported experiencing feelings of social isolation and strained relationships—in two instances resulting in relationship breakdown.

However, in the professional setting, subjects generally reported positive effects: a deep sense of career satisfaction, strengthening of bonds with coworkers, and a high level of respect within the workplace:

- ''Having the opportunity to take care of those patients in those sometimes challenging situations gives you a good experience to continue your professional development.''
- ''Professionally, I think [the rescue experience] has gained me more respect from my peers, from my co-workers. It has caused me…to have a desire to sharpen my skills on a constant basis–to stay on top of my game.''

Despite these positive professional effects, some subjects complained of occasional symptoms of burnout:

- ''I got to a point where I thought maybe I should get out of this world and not do this anymore.''

Multiple themes arose related to the availability and effectiveness of psychological support (Table 3). Subjects tended to report an ingrained culture of stoicism and a paucity of psychological support within the backcountry community, but acknowledged a growing awareness of and responsiveness toward psychological issues in recent years:

- ''People in the room venting about what went wrong and then being told to put their boots on and go to work the next day—that's the culture that I worked in for 20 years and that I'm happy is finally starting to change.''

Participants generally considered informal psychological support from social support networks to be the most effective aid:

- ''I think the best support is just being around those people, without really even needing to talk that much, just being around [them]. The folks that I have the best relationships with are arguably the best informal psychological support.''
- ''A lot of that just comes from our team or our community. We live in a pretty small community, so people will know that there's been an incident in the community and they'll reach out and get in touch; they'll drop cookies off at the building where we rescue from, team members take care of each other, offering to help with babysitting with kids or whatever else they need if somebody is really struggling.''

In some cases, respondents described the informal support network as insufficient:

- ''Ski patrollers and avalanche workers are great dark humor comedians. Informally we are always standing around having a beer—or six—depending on how bad of a day it was and joking. The famous joke around here is, 'that was the deadest man I've ever seen.' It is

Table 2. Long-Term Effects of Avalanche Rescue on First Responders

Theme	Representative quotes
Panic symptoms are prevalent among avalanche first responders.	''Yes, I had generalized anxiety when I entered an environment where avalanches were possible. I would get to the rope line of the ski resort and I hadn't left—still in bounds, totally safe—just getting to the rope line I would start getting very anxious. Not a panic attack necessarily, but butterflies in my stomach, feeling like something was wrong, feeling anxious. And there was no immediate danger because I was just standing there—and I knew that so I could observe, you know, I'm overly anxious right now for no reason and I can't calm down.'' ''The first five times I went back out into the mountains I had a sense of generalized anxiety that wouldn't go away that I had to work through. I have enough of a background having taken some psychology courses at university that I understood intellectually what was going on but I couldn't control it physically or physiologically. So I just dealt with it and kept re-exposing myself to that situation with the knowledge that gradual re-exposure lessens its impact…''
Symptoms of anxiety are prevalent among avalanche first responders.	''There's always feelings of anxiety. You go out, you do a rescue, and you wonder when is it going to happen to me. It doesn't last long, but it makes you wonder, 'what am I exposing myself to.''' ''Anxiety, if you call difficulty sleeping—that was probably the worst thing.'' ''I think the most unnerving thing was the constant feeling where I was no longer in control of my own emotion, and I always felt like I was on the edge of holding it together.'' ''…just from seeing what can happen it maybe causes me to be more aware of my surroundings, and thereby causes me some anxiety when I'm in certain terrain features and certain snow conditions where I'm on alert and experiencing anxiety because I'm imagining what can go wrong in my mind.'' ''I've always had some social anxieties, but possibly these have been a little more heightened for a week or so after a rescue.''
Symptoms of depression are prevalent among avalanche first responders.	''Lack of interest in participating in winter and any high risk behavior, and I'm sure I did feel depressed…'' ''…the level of engagement that you experience in a rescue brings feelings of disengagement when you go back to a normal day-to-day—I call it an 'over-stimulation hangover.''' ''I mostly carry around a tremendous amount of guilt about the double avalanche—that I opened the terrain and that I wasn't the one who died in it. Depression is the major emotion I deal with on a daily basis.'' ''There have been times where I have been sad for sure—incidents with colleagues in the same industry, some of those hit closer to home and made me feel down. But for me, being in this industry for as long as I have, I hate to say it but it comes with the job.'' ''I remember thinking for a long time that maybe I should just give it all up, maybe I shouldn't do it, feeling lost for a minute.''
Symptoms of acute stress disorder and PTSD are prevalent among avalanche first responders.	''The more traumatic it is the more burned into your psyche it is. I've never experienced that option of 'I'm not gonna think about this.' It just doesn't work that way. It's the prevalence of the thoughts that's difficult to escape.'' ''Yeah, I've had nightmares, I guess flashbacks. Occasionally I will, especially the ones that hit closer to home… Nightmares, trouble sleeping. Socially I find maybe I was shut down a little bit, probably because I was sad.'' ''Hyper-awareness was very big, I was constantly looking over my shoulder and wondering what was happening next. Hyper-arousal for sure. Nightmares, flashbacks, complete social disassociation—staring into space and not wanting to be part of anything or anybody. Anxiety for sure goes along with the hyper-awareness.'' ''I'd say hyper-arousal. I definitely, after a rescue has happened, I have a ton of energy and it's really hard for me to go asleep that night. I can be up kind of replaying it. My body is jittery and has a lot of adrenaline running through it after a rescue…. Also, sometimes I have some avoidance surrounding doing activities myself.'' ''Re-experiencing of the event—I've gone through it many times in my head. …. Negative thoughts—no, nothing like that. Hyper-arousal—yes, to the same stimulus initially, which would be a snowy slope.'' ''I have a pretty serious nightmare problem where I see all the faces of the avalanche victims on a pretty regular basis.'' ''Persistent re-experiencing and hyper-arousal on the mountain. It wasn't that bad off the mountain but was much worse in that environment.''

(*continued*)

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Table 2. (Continued)

Theme	Representative quotes
Avalanche rescuers commonly self-medicate using alcohol.	''[Avalanche Rescue] been the major contributing factor to me becoming an alcoholic. It's endemic in the ski patrol culture, unfortunately. Every night after work we'd hit the bars. I didn't realize how much I was drinking every night to basically numb my feelings instead of managing them. I was drinking way too much after work.'' ''Probably self-medication with alcohol [is the informal source of psychological support that I received after avalanche incidents]. Not probably, but definitely.'' ''…yeah, I can burn through alcohol given the opportunity after a traumatic experience, and that's part of the ski patrol culture in many ways. Bad things happen and we go to the bar—it isn't healthy but that's just the way that we deal with it.'' ''I probably had enough alcohol immediately afterwards that I wasn't going to be dreaming anyway because my body was processing poison. Avoidance of trauma-related thoughts—yes, as a result of self-medication.''
Bars are commonly used as a venue for informal postincident de-briefing.	''Where I worked the practice was that we would have a post-incident de-brief that was often monitored by the local physician who was our medical control for our ski patrol. Often this involved a whole bunch of alcohol and a whole bunch of people in the room venting about what went wrong and then being told to put their boots on and go to work the next day.'' ''Yeah, over the years there's been kind of a peer support group, or at least that's what it started as. Sometimes there was none—or it was going to the bar quite honestly.'' ''Alcohol—there was probably a little bit of an increase there, but not because I wanted to drink, but more people getting together to talk about the situation and it seemed to be the medium that it was done around—alcohol—whether you were at the bar or getting together to talk about it.''
Psychological effects of avalanche rescue often persist on the order of years.	''I'm five years out and I'm still talking about stuff.'' ''For the worst one, years: a friend was killed in a slide when he and I were out touring, and that one still sticks with me and makes me somehow relate to other incidents when I'm out in the field.'' ''I was involved in my first avalanche rescue in 1997 and I still think about that one on a fairly regular basis.'' ''I think that they've probably lasted a couple of years, but were just never dealt with…'' ''To this day, so 8 years. The anxiety still exists for me.''
Avalanche rescue is associated with strained personal relationships.	''Pretty much I haven't been in a relationship for longer than a couple of years. The double avalanche fatality I worked on in the early 2000s was a pretty big contributing factor to my divorce, and I haven't been in a stable relationship since then.'' ''Whether or not you think the thing is affecting the relationship, it's affecting your actions, which affects your behavior, which affects your relationship. So I think it did affect all of my relationships because I went and self-medicated.'' ''Devastating [effect on my relationships]. I ended up divorced through it. I can sum that up in like really simple words, which is that when we need what we need, we are in the worst place that nobody wants to deal with us, even the people that supposedly love you, because it's not very attractive.'' ''I tend to be more irritable after a negative result, which doesn't work out well for the family.''
Avalanche rescue may lead to relational isolation.	''I feel quite isolated in the mountain community now. I don't do a lot of touring with my friends anymore as it scares the shit out of me. In a backcountry travel setting, for better or worse, I'm more comfortable being vocal about route choice and stirring up the group dynamic where I disagree with the leader or the group. It's limited my group.'' ''Socially I find maybe I was shut down a little bit, probably because I was sad.'' ''I have a really strong belief about that which I've said to the leadership on my team: we talk about how we have each other's backs, but we don't. You have my back when we are on a rescue and you empower me to make me feel like I'm a badass; but what you don't do for me is when I'm depressed, when I'm in my darkest hour, when I need someone to listen, nobody is there. Because everybody's just got to get on with their life. Nobody wants to hang out with somebody who's had a nervous breakdown or who's depressed, because that's just not fun.'' ''I may have experienced for a short time some kind of antisocial behavior shortly after the death of my friend. I think that may have been a result of feelings of guilt that maybe I had something to do with him losing his life.'' ''…complete social disassociation—staring into space and not wanting to be part of anything or anybody.''

(*continued*)

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Table 2. (Continued)

Theme	*Representative quotes*
Avalanche rescue may strengthen professional relationships.	''I'd say there's an appreciation for the brevity of life in relationships with family. That things can happen suddenly and don't take every day for granted. And within the team there's a building of—when you do tough things together, deal with tough situations together—you grow, bonds grow. That's a good thing.'' ''I think it deepened my relationships with the two individuals I was there with.'' ''I think if anything [avalanche work with my partner] made [our relationship] stronger. Having had this success that we've had with dogs and bringing closure to the situation has been a pretty moving experience.'' ''I think in my professional life it has caused me to have a stronger, closer relationship with the other rescuers that I've been on those rescues with. In my personal life, it has strengthened the friendships that I have with the people that were there with me that day—we have a very deep bond as a result.'' ''In general, the experience is closer at work—everyone's in the same position and is a little more empathetic.'' ''I think in my professional life it has caused me to have a stronger, closer relationship with the other rescuers that I've been on those rescues with.'' ''It's essentially all been positive, strengthened my professional relationships, given us a greater sense of camaraderie and connection to your teammates.''
Avalanche rescue work often precipitates professional growth.	''It did make me think that life is short and that I should be doing what makes me happy, so in a sense it may have affected my decision to sell my business.'' ''I developed a reputation of being really cool and calm and so I got to lead a lot of larger scale rescues.'' ''Having the opportunity to take care of those patients in those sometimes challenging situations gives you a good experience to continue your professional development.'' ''I think that the fact that I've been able to go through these experiences has probably made me stronger [in a professional setting].'' ''It has caused me, if anything I would say, to have a desire to sharpen my skills on a constant basis—to stay on top of my game.'' ''It was a catalyst for positive change [within my professional life], for letting go of who I thought I was and instead shifting gears and setting me on a path to be more open-minded and question what I thought to be true. I ended up changing careers.'' ''No anxiety, just mental clarity on how to go about your day-to-day motions—it's made me extra diligent and more engaged in trainings and things like that.'' ''They continued to help me grow professionally with the experience. Having the opportunity to take care of those patients in those sometimes challenging situations gives you a good experience to continue your professional development.''

PTSD, posttraumatic stress disorder.

effective to some extent—that camaraderie is key, and a lot of patrollers report being able to disassociate with it and they have no problems. For some people, such as myself, it was effective for a long time, but it ceased to work and I finally broke.''

The main modality of more formal psychological support described was after-action debriefing—often incorporating elements of psychological first aid—which ranged widely in quality and utility. Respondents favored formal group-based and individualized options in instances where high-quality ones were available, but felt that debriefs were often inadequate when facilitators lacked appropriate training (Table 3).

Many respondents offered suggestions as to how the psychological effects of rescue work could be mitigated (Table 4). Avalanche rescuers generally regarded their formal avalanche training highly, but endorsed a clear need for greater preincident and postincident support:

- ''My first aid training and experiences made me adequately prepared to deal with the real event, but I had never received any psychological preparation. The actual psychological trauma—no, I wasn't prepared at all. I don't think any ski patrollers get any psychological training to deal with it.''
- ''I think that just letting people know that these events are very traumatic and have very serious effects should probably be more of a component in the training. When I teach avalanche training myself, I try to impress upon people that it isn't about being a tough guy or anything else, but it's about being honest that it affects people very differently and that there is professional help out there.''

Additional recommendations for improvement included training exercises with greater emphasis on the physical intensity and psychological risks of avalanche work, after-action debriefs utilizing mental health professionals, proactive long-term psychological monitoring and support, and individualized psychological support when necessary.

Discussion

This qualitative study examined the long-term psychological, personal, and professional effects of avalanche res-

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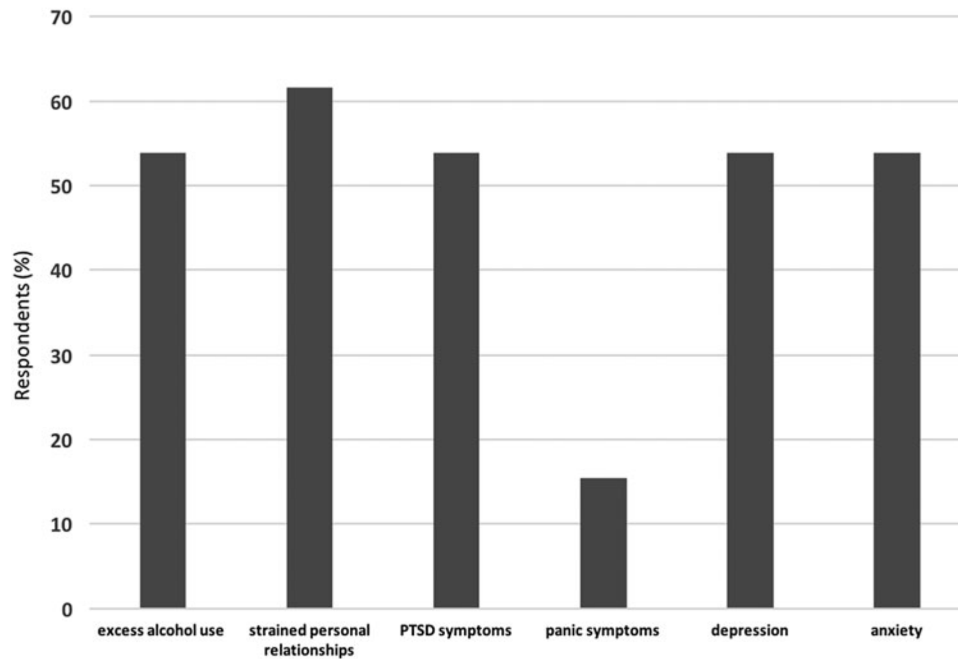

FIG. 2. Frequency of mental health-related symptoms among avalanche responders.

cue work on first responders, as well as the perceived availability and sufficiency of psychological support for such individuals. Participants suggested improvements to avalanche training programs as well as preincident and postincident psychological support.

Long-term effects

Avalanche rescue work is likely associated with a wide range of mental health sequelae that escape formal diagnosis. One of the most striking themes to emerge is a culture of alcohol dependency within the backcountry rescue community. While some subjects reported only a slight increase in their alcohol consumption in the immediate wake of an incident, others openly admitted to substantial self-medication with alcohol as a means of coping with occupational stress. Drinking establishments commonly serve as venues for informal postincident debriefs in the backcountry rescue community.

In addition to varying degrees of alcohol use, subjects also described symptoms of depression, anxiety, panic disorder, acute stress disorder, and PTSD. Indeed, prior studies have demonstrated that disaster responders with more frequent or severe PTSD symptoms are more likely to drink as a coping mechanism (Stewart et al., 2004). The relationship between alcohol use and other psychological morbidity in this population warrants further attention.

Psychological support

There was consensus among subjects that, historically, limited psychological support has been available to avalanche first responders; nonetheless, respondents indicated that the situation has been improving. We observed a culture of stoicism in the rescue community, resulting in lack of awareness, dialogue, and support pertaining to the psychological effects of traumatic rescue work. However, in recent years, there seems to be a growing awareness of and responsiveness to this issue, although to varying degrees depending on location and institution.

After-action debriefing sessions reportedly vary dramatically in effectiveness, ranging from informal discussions to formal sessions overseen by experienced clinicians. Consequently, there is considerable variation regarding the effectiveness of these debriefs, leading to strongly held opinions about their utility. No subjects reported engaging in the newer practice of psychological first aid, although components of it—including contact/engagement, comfort, practical assistance, and linkage with services—were occasionally offered.

Suggested improvements

The technical aspect of avalanche training is generally highly esteemed within the backcountry rescue community, but there is a clear need to better prepare rescue workers for the physical intensity and psychological trauma of avalanche response. While this study suggests that it may not be possible to prepare avalanche first responders for the psychological impact of backcountry rescue, it suggests a number of potentially measurable changes to the current system: first, responders suggested that avalanche training should incorporate more physically intense drills and emphasize the psychological morbidity associated with real-life incidents. Second, respondents felt that after-action debriefs should routinely involve trained mental health professionals. And finally, long-term psychological support may be improved by being more proactive, incorporating periodic professionally mediated workshops, ongoing monitoring from medical professionals, and individualized psychological support where needed.

Exclusions

Certain interview data were disregarded in the analysis. Quantitative data pertaining to the state of the victim(s) and presence of an air pocket(s) were omitted due to widespread difficulties recalling such details among subjects. Qualitative

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Table 3. Availability and Effectiveness of Psychological Support for Avalanche Rescuers

Theme	*Representative quotes*
Historically, there has been a culture of stoicism in the rescue community, but this appears to be improving.	''There has also been a suck-it-up mentality, and I was certainly a part of that problem for a while. There is starting to be more of an awareness of the impact of professional psychological help.''
There is a paucity of formal psychological support for professional avalanche first responders.	''I didn't really receive any formal support.'' ''…no formal, you know, no formal mental training.'' ''Only once during my career has an avalanche coworker asked if I was OK, only once. I never received any formal debriefing or anything like that. It wasn't until last year when my brain had finally had enough that I was finally diagnosed with solid PTSD.'' ''No, I haven't had any formal post-incident [debriefing?].''
After-action debriefs are a common source of formal support	''So in big incidents we often do an after-action report. We all get together and sometimes there's counselors available on site. We have had one member of our team die during a rescue, so at that point we were offered services with counselors at the after-action review as well as personally.'' ''Where I worked the practice was that we would have a post-incident debrief that was often monitored by the local physician who was our medical control for our ski patrol.'' ''We do our own attempt at an after action review, which goes over what happened and what we would have done differently. It's more formalized when there are fatalities. Sometimes it's just with the group, other times with other organizations.'' ''We've had various trainings with critical incident stress management trainings through our team and then also through my employment with the fire department over the years.'' ''So there's critical incident de-briefs that take place after any kind of messy event.''
Subjects often find informal forms of psychological support, such as talking with coworkers and family members, to be most effective.	''So I've always found the informal to be what I need…'' ''I think the team support has always been the most effective for me personally.'' ''One of the most [helpful things] was speaking with another individual, a friend, who had experience of a similar situation—losing their best friend and being part of the rescue. Speaking with that person was extremely helpful to me.'' ''I think it's just [most helpful to have] the informal conversations with other members that were involved.'' ''That is probably my biggest support—[my wife] and the kids.'' ''[Support came] mostly from my mom, being able to have a very open and candid dialogue.'' ''I'm a closed person who doesn't talk about those things too often—when I do talk though it does help. If it's not a big deal it gets taken care of in the debrief, if it's a bigger deal it may take me a while to process, and talking at home is more important.'' ''My wife has been a wonderful support, actually she's been the best support.'' ''My family lives here… so I have a pretty much endless resource of informal support. I have a wife and my sister, they know what I do and what I deal with so it's pretty easy for me to discuss with them.'' ''Yeah, the workplace is a big support system for me. My coworkers. We all do the same thing, we all know how each other feels.'' ''But we also look after each other as a team; so, if there's something that happens in the field—somebody has to find someone who's deceased—then the team tends to check in with each other, giving a call, making sure they're OK, bringing them coffee, whatever they need.''
Subjects appreciated formal psychological support when it was deemed high quality.	''I found it helpful to debrief because it allowed me to reflect on things from an objective perspective, see both sides of the scenario, and put everything together in your head; it helps you reaffirm what you did well and mentally prepare for the next event.'' ''It's a helpful stage in the sequence of stages: working on the scene, debriefing with your team, debriefing with the people who worked on the site, debriefing with yourself, and debriefing with your family.'' ''And now, there is over the past several years, there's been a very good support group that addresses the debriefing and critical incident de-briefing, and some of it I think is rather effective.'' ''But in my personal rescue with my friend—there was a psychologist that visited us and talked with us and did a debrief with us and offered assistance. That was really helpful at the time.'' ''It was actually recognized by a coworker—my CEO of all people—….he was very supportive and the company was very supportive and I got the help I needed. Both a psychiatrist and a psychologist.'' ''I've found a local counselor that specializes in PTSD, and have only recently been able to admit to myself that perhaps I'm more damaged than I realized. The counseling has helped me start to deal with some of the baggage that I carry around.'' ''I participated in doing EMDR [Eye Movement Desensitization and Reprocessing], which is what worked for me.'' ''A licensed psychologist that was able to diagnose my conditions and give me effective and accessible techniques that were unavailable to me prior [was the best thing for me].''

(*continued*)

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Table 3. (Continued)

Theme	Representative quotes
Subjects found de-briefs unhelpful in instances where the facilitator lacked adequate training.	''For some of the bigger ones there were folks that would come in, not really well-trained but well-intentioned.'' ''I find those not very helpful. Generally the person has training but not appropriate, I find they are good people that have good intentions, but they don't understand the work and they're not doctors, they're somebody who facilitates a debrief.'' ''One the support doesn't exist, in my opinion, because the support that's put out for folks—they're woefully ill-prepared, they're counselors, they're not doctors, and not even practitioners, they're counselors. And that's great if you're running a camp for kids in the summer time, but that's what's offered to folks that are arguably in PTSD, dealing with severe depression, or trauma that they can't even wrap their head around.''

Table 4. Lessons Learned and Recommendations for Improvement

Theme	Representative quotes
Overall, the technical aspect of avalanche training is considered effective.	''I think that from an operational standpoint and understanding how avalanche rescue works, I was totally prepared and ready to manage and deal with those situations.'' ''I feel like we are adequately prepared for when it happens. It can be of course a physical drain, but I felt like we were adequately prepared by all means.'' ''I've been pretty prepared for all the avalanche rescues that I've had to go on.''
Training together with other rescue personnel facilitates smoother real-life rescues.	''For us we are so close to several organizations that we have the ability to train pretty regularly with the local air and fire assistance—especially fire, which is literally across the street from us. It's definitely helpful when you know the next point-of-care well as it's a trust issue—they can trust what I'm telling them if I've given them the correct information on the last ten cases we've worked on.'' ''If you didn't train with the ski patrol, they wouldn't know how to help us in order to get somebody to an ambulance as soon as possible, but because we train with them they understand our communication, they understand which radio frequencies they should be on, they know how to package a patient and how to get them ready so that we can come in and move them as quickly as possible….It's also a huge difference not just for us, but for the patient, because if you can save 5 minutes off at each point of transfer then you're more likely to get someone the help that they need when they need it.'' ''It definitely helps when you recognize your flight nurse or whatever and can greet them by name—it just makes everything a more fluid and friendly environment, because avalanche rescue is not a pretty thing, you never feel great while you are doing things.''
Avalanche training does not sufficiently prepare trainees for the physical intensity of a real avalanche.	''The one thing that I don't think anyone gets and that isn't conveyed in avalanche training is how physically testing the experience is. It's terrifying and incredibly physical. You are completely overwhelmed physically.'' ''It's rare to train on big hard slabs of snow. When you train to dig out a body it's very different from a real life situation where you may just have the toe of a boot sticking out from a big hard slab of snow.'' ''It is certainly a lot different on scene of a real avalanche on the scene—avalanche debris, coordination, physical stamina, things like that.''
Avalanche training does not sufficiently prepare trainees for the psychological trauma of a real avalanche.	''The actual process was way more difficult and different than I would have expected from my avalanche training. Initially I thought it would be simple, but it quickly turned into 'oh my God, my friend is dying.''' ''The problem with all the gear and education and skis is that people think that they will ski out of the avalanche or float above it with their airbag. The trauma and seriousness of avalanches isn't properly conveyed in avalanche education.'' ''I'm a highly trained individual that has been involved in scenario-based training for arguably 22-years, but after doing that work all of that training does not prepare me for what I have to do. It's a misnomer, a joke. You train me to respond, but you don't train me to deal.'' ''To deal with the event, yes [I felt adequately trained]. To deal with the psychological trauma, no.'' ''I've learned a lot and become a much more emotionally balanced person because of it, but the trauma that had to come along the way to get there was unnecessary. And it's because you're trained to do a job, you're not trained to deal with the issues.'' ''It's one criticism I've had of some avalanche education—it's kind of taken too lightly sometimes, it's kind of like 'OK, we're looking for a beacon!' but you're not looking for a beacon, you're looking for your best friend, you're looking for a living, breathing human being. I think that's maybe the part that people may find themselves unprepared for.'' ''I feel that people are gonna know what to do skill-wise. It's the mental aspect of seeing someone in an avalanche or seeing a fatality or that aftermath that's the hardest thing to prepare for.''

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Table 4. (Continued)

Theme	Representative quotes
Avalanche training could be improved by increasing the physical intensity of training drills.	"I would make the avalanche training more physically demanding and spend the whole time almost having people experience what it is like shoveling deep snow." "I think that [physical] intensity in the training is potentially helpful to prepare people emotionally for what that situation is going to be like, so that they can be better prepared going into it.." "I think the beacon drills should be really intense in the training. It should be really intense. Because the more intense it is in the training, the better prepared you will be when your time comes, because it's going to be way more intense when you're dealing with a friend, it's a lot of emotional distress."
Avalanche training could be improved by emphasizing the psychological trauma associated with avalanche first response.	"Any sort of rescue training should address the mental rigors associated with being out in extreme environments for long periods of time." "Sitting down and discussing past accidents and the possible outcomes—not just the physical but also the psychological hazard—should be a part of the training….The point is to get across to people that there is a hazard not just to your body but to your brain and to your emotional well-being." "As much time as we spend training the skill—meaning how we rescue—that's how much time we need to be spending on the self, on the emotional part of that person. I've had a tremendous investment into my mind and into my body, but very little into my heart."
Preparation for avalanche rescue work should include a variety of psychological skills and interventions.	"Give them the opportunity to communicate with and ask questions of a real-life first responder who has had first-hand experience." "Professional workshops bringing together snow and avalanche professionals in a group setting are helpful." "I think it might be helpful if expectations were managed a little more; we're getting better at that as an industry, but it's tricky—I train a lot of young guys and you don't want to beat them down with the harsh reality, but you also need to check the expectations." "I think just, again, setting expectations and having people understand what potentially could happen—patients may be deceased when they find them." "I think that it helps people deal with it knowing ahead of time that you're probably going to experience these feelings—they're normal, they'll fade, and you should get help." "It would be interesting to see an avalanche rescue organization or any search and rescue organization to look at having mental health workers coming in and talking to trainees during training seminars." "So my personal belief is that anybody that's working in these types of situations needs psychological intervention on the front-end at a high professional level, and they actually need monitoring while they are in their work."
It may not be possible to prepare avalanche rescuers in a classroom setting.	"The trauma and seriousness of avalanches isn't properly conveyed in avalanche education, and I'm not sure if it can be." "I don't know that there's a way to prepare a rescuer for what they are going to see until they actually see it. You can talk to them about it but that's never going to actually prepare you for what you are going to see." "So based on my experience there is no amount of training that psychologically prepares you for rescue work until you're actually doing it." "In my experience, even though you can prepare yourself to go into it, it's far worse—can go through it in my mind, but I can't prepare myself for it." "So I would say it was more violent and significantly more destructive than you can plan for unless you've been there." "There are some things that we can't prepare for like the actual realism of the slide itself—freshly broken trees, trying to navigate across large boulders of snow, and things like that." "As a supervisor, I try to prepare people psychologically for what's out there, but you just can't."
Long-term support for professional avalanche first responders should include interventions focused on mental health:	"Professional workshops bringing together snow and avalanche professionals in a group setting are helpful. There is also a helpful database of near-misses (avalanchenearmiss.org in conjunction with the National Avalanche Center), which is a forum for avalanche workers to anonymously reach out to others who have been in similar incidents—I think a lot of people use it and find it helpful." "…if I had my way, my team would have a doctor of psychology, psychiatrist, whatever—we would have a doctor assigned to the team for individuals that are interfacing with the highest amount of stress. That would be part of it—like you just go to counseling, that's just part of work. For me, the piece of it is that once you experience it, everybody should just do this for like general maintenance, not when you have psychological trauma, because when you're doing it there then you're trying to rework everything." "I'd love to see a doctor on my team and I'd love to see intervention on a regular basis on a one-on-one."

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data pertaining to *Incident* and *Prehospital Interactions* questions were disregarded due to lack of cohesive themes therein.

Limitations

This study has limitations. Although the study size is sufficient to generate hypotheses it may not be possible to make generalizable conclusions, given the sample size, overrepresentation of male and professional first responders (92% male, 93% professional), underrepresentation of female and layperson responders, and geographic limitation to subjects in Utah, Wyoming, and Colorado. Moreover, it is possible that the small sample size is not large enough to elucidate all underlying themes; however, the recurrence of themes in multiple interviews suggests a degree of saturation that implies that major themes have been identified.

Furthermore, bearing in mind that questions pertaining to mental health are deeply personal, subjects may have felt uncomfortable being completely open in a single interview conducted over the telephone. The primary mode of outreach was to professional avalanche rescue organizations; upon establishing contact with these organizations, individuals with a particular interest in mental health outcomes may have been more likely to participate; and as the study progressed, new participants were frequently referred by previous participants, who may have been motivated to refer like-minded individuals.

In addition, the vast disparity in avalanche rescue experience may have confounded the analysis; it seems inevitable that a first responder in the infancy of their rescue career would demonstrate profoundly different psychopathology to one who has worked on upwards of 50 avalanches over a period of 20 or more years, and as predicted, such differences were evident in the transcripts. In this regard, prior studies have yielded conflicting results when examining if professional responders with more years of service tend to experience greater or lesser degrees of posttraumatic, stress, and depressive symptoms (Brooks et al., 2016).

Finally, the very nature of the interviewer-subject relationship introduced limitations; the interviewer inevitably approached the study assuming that avalanche rescue is inherently psychologically straining and the interview questions were developed from that perspective—these inherent preconceptions introduced bias simply by influencing what questions were asked and the manner in which they were posed.

Future directions

In light of the aforementioned limitations, three directions for future work are suggested. First, larger studies may be helpful: as the pool of relevant and willing participants in Utah, Wyoming, and Colorado was effectively exhausted in the first round of interviews, either geographical scope should be broadened or the approach to subject recruitment should be augmented, possibly utilizing telephone outreach as a supplement to e-mail and social media. Second, future research could focus exclusively on professional first responders, considering that such individuals are both more likely to be recruited (as evidenced by this study) and more likely to experience additive psychopathology. Third, future subjects could be stratified according to the number of years they have worked in a first response role and number of avalanches they have participated in—both important themes in this initial study.

Of note, a revision of the interview format to include in-person interviews was considered, but ultimately deemed unhelpful—subjects were too geographically dispersed and often favored the relative anonymity of a telephone call.

Conclusions

As noted, our data suggest grounds for the following hypotheses: first, avalanche first response work is likely associated with significant psychiatric morbidity. Second, there is a paucity of psychological training and support among different backcountry rescue organizations, oftentimes consisting of ineffective after-action debriefs performed by individuals perceived to be underqualified. Finally, formal professional psychological support is generally positively received when available.

Future studies should seek to test the effectiveness of the aforementioned improvement recommendations pertaining to psychological preparation, postincident psychological support, and long-term psychological monitoring and maintenance for avalanche first responders.

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Author Disclosure Statement

N.D. and C.T. conceptualized and designed the study; ND conducted, transcribed, and coded interviews; N.D. drafted the initial article; and C.T. edited and revised a final version. Neither of the authors has any relevant conflicts to disclose.

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