CONCEPTS

Mental Health Response to Acute Stress Following Wilderness Disaster

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Expedition physicians should be prepared to respond to traumatic stress disorders following wilderness disasters. Stress disorder symptoms include re-experiencing the traumatic event, avoiding stimuli associated with the traumatic event, and increased physical arousal. These symptoms can also be seen in healthy individuals, and should only lead to disorder diagnosis when they cause distress or impairment. Treatment options for stress disorders include observation, psychological interventions, and medication. Approximately half of those with diagnosable stress disorders will return to nondiagnosable status over time without therapeutic intervention. Psychological interventions with empirical support concentrate on providing either noninvasive support in the short term, such as psychological first aid (PFA), or more long-term controlled re-experiencing of the precipitating trauma, such as many exposure-based therapies. Exposure-based treatments can result in temporary increases in symptoms before long-term gains are realized, so they are not recommended for wilderness settings. Medications to treat stress disorders include benzodiazepines, propranolol, and antidepressant medications. Benzodiazepines are often carried in wilderness first aid kits, but they provide very limited stress disorder symptom relief. Propranolol is being explored as a method of preventing traumatic stress disorders, but the data are not currently conclusive. Antidepressant medications are a good long-term strategy for stress disorder treatment, but they are of limited utility in wilderness settings as they are unlikely to be included in expedition medical kits and require approximately 4 weeks of administration for symptom reduction. Recommendations for wilderness treatment of stress disorders focus on increasing knowledge of stress disorder diagnosis and PFA.

Key Words: wilderness, mental health, acute stress disorder, posttraumatic stress disorder, traumatic, acute, psychological first aid

Introduction

Wilderness expeditions often involve exposure to physically risky situations, which can lead to serious mental health disturbances, termed traumatic stress disorders, when the situations result in actual or threatened death or serious injury. All surviving members of an expedition that encounters a significant physical threat are at risk: both those who were directly threatened and those who were in fear for their team members' safety. The isolation involved in expeditions can strengthen the emotional ties between the team members, while distancing them from their more accustomed emotional supports at home. This makes wilderness traumatic events extremely sa-

lient to the survivors, while decreasing their range of available coping strategies. Further, isolation in wilderness settings frequently leads to a delay before expert mental health treatment can be sought. Expedition physicians and leaders should be ready to identify possible cases of traumatic stress disorders and able to initiate psychological first aid (PFA) within the wilderness setting.

Diagnosis of Stress Disorders

Diagnostic criteria for traumatic stress disorders are described in detail within the Anxiety Disorder section of the American Psychiatric Association's *Diagnostic and Statistical Manual* (DSM-IV-TR).¹ Diagnosis requires exposure to a stressor that is defined by 2 components: objective exposure to a traumatic event that involved

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actual or threatened death or serious injury, as well as the patient's subjective responding to the event with intense fear, helplessness, or horror. Presence of both objective and subjective components greatly contributes to post-trauma psychopathology.² Additionally, the presence of 3 types of symptoms following exposure to the stressor is required for diagnosis: persistent re-experiencing of the traumatic event, persistent avoidance of stimuli associated with the traumatic event, and persistent increased physical arousal. All 3 symptom types must be present for diagnosis. Common ways to re-experience traumatic events include recurrent recollections of the event, distressing dreams about the event, feeling as if the event was reoccurring, or intense psychological distress or physiological reactivity in response to cues about the event. Avoidance of stimuli associated with traumatic events often includes efforts to avoid thoughts and activities linked to the event, inability to recall important aspects of the event, feelings of diminished interest in significant life activities, detachment from others, restricted range of affect, and a foreshortened sense of the future. Increased arousal following traumatic events is often seen as sleep disturbance, irritability or anger outbursts, difficulty concentrating, hypervigilance, and an increased startle response. Acute stress disorder (ASD) is diagnosed if the symptoms are experienced for a minimum of 2 days and a maximum of 4 weeks, beginning within 4 weeks of the traumatic event, while posttraumatic stress disorder (PTSD) is diagnosed after the symptoms persist for more than 1 month. Clinically significant distress or impairment in important life function is required to diagnose either of these disorders.

ASD is the most likely appropriate diagnosis for people with clinically significant distress or impairment following exposure to a trauma in the wilderness. As wilderness expeditions often involve significant effort to return to sites of more definitive care, ASD will often have time to present during expedition evacuation or conclusion. Presence of an ASD could signal a future PTSD diagnosis, or it could be the result of immediate difficulty with resolving the traumatic event that will resolve before the time requirement is met for PTSD diagnosis. PTSD is an unlikely diagnosis in a wilderness setting due to the diagnostic time requirement of symptoms that last for greater than 1 month; it is highly likely that evacuation to definitive care will be completed long before PTSD can be accurately diagnosed.

Rates of stress disorder following a traumatic event vary greatly based on type of event. Exposure to objective traumatic events that meet the above DSM-IV criteria is quite common, with 59% of a community sample able to describe such an event within their lifetime,³ and PTSD is a common diagnosis, with a 7.8% lifetime

prevalence in the United States.⁴ However, this includes a number of traumatic events that are highly unlikely to occur within a wilderness setting. In a separate community sample, Breslau and Kessler⁵ highlighted the important role of less potentially traumatic events in disorder development. Within a general sample, 34.0% were exposed to an injury or shocking experience trauma, such as a serious physical injury or a natural disaster, and 6.1% of those exposed developed PTSD.

Although many factors affect likelihood of PTSD development, the most important are clustered around resiliency, or stress coping ability, at the time of trauma exposure. Resiliency has been broadly described as including feelings of personal competence, trust in one's instincts, positive acceptance of change, feelings of control, and spiritual influences.⁶ A major meta-analysis found significant influence of both current life and response characteristics, including perceived life threat during the trauma, posttrauma social support, and emotional responses and dissociation during the trauma, and previous life circumstances, including prior trauma, prior psychological adjustment, and family history of psychopathology, in predicting PTSD development.⁷ However, the most important factors in predicting PTSD development were psychological responses during the trauma. This finding links with work from the military that showed strong social and unit support was strongly related to increased resilience, which acted as a protective factor against PTSD development.⁸ Together, these studies emphasize the importance of monitoring psychological response to trauma, and providing strong support to enhance resiliency and decrease immediate negative reactions.

All team members on wilderness expeditions that result in significant injury are at risk for developing stress disorders and should be assessed accordingly. The most likely traumatic events experienced in wilderness settings are physical damage secondary to exposure to rugged terrain. Over 70% of all wilderness-based nonfatal injuries are musculoskeletal and soft tissue damage, with 38% of such injuries involving damage to the legs.⁹ The presence of such an injury will often greatly impede standard plans for expedition evacuation due to resulting lack of physical functionality, and will demand increased evacuation assistance from other team members. Experiencing a serious injury is more likely to result in PTSD (16.8%) than observing a death or serious injury (7.3%),⁵ but team members who are exposed to the injury, either through observing the initial damage or through interaction with the injured person during evacuation, are also at notable risk. The above PTSD development rates suggest that more than 1 person in 20 will develop a stress disorder following a traumatic expedition-based event. In

detecting stress disorders, it is important to realize that the presence of intense fear, helplessness, or horror in response to the injury is more diagnostic of stress disorder development than level of involvement with the injury.²

Treatment Options for Stress Disorders

Once stress disorders are diagnosed, their appropriate treatment becomes the immediate concern. An initial option worth consideration is observation while waiting for spontaneous recovery from traumatic stress symptoms. If observation does not prove feasible, approaches to stress disorder treatment can be divided into 2 time-based spheres: immediate treatment of ASDs in the field and delayed treatment following ongoing symptoms that have resulted in diagnosis of PTSD. Although immediate treatments have more direct applicability to wilderness settings, knowledge of delayed treatments is critical in designing management of acute difficulties in a way that will not exacerbate the current symptoms.

The 2 primary immediate psychological interventions available for people who have negative emotional reactions to traumatic events are critical incident stress debriefing (CISD),¹⁰ which lacks empirical support in reducing stress disorders,¹¹ and psychological first aid or PFA,¹² which has not been conclusively empirically tested but shows promise for reducing stress disorders. Both CISD and PFA were designed to be delivered in field settings. Most empirically supported delayed psychological interventions involve a variation of exposure to memories of the traumatic event,¹³ and are inappropriate for delivery in the field.

The 2 primary medications worth considering for immediate administration following trauma are benzodiazepines and propranolol. Benzodiazepines are often available in wilderness settings and can reduce behavioral activation, but they do not directly target traumatic stress symptoms of re-experiencing and avoidance.¹⁴ Propranolol shows promise at reducing stress disorder development¹⁵ but it requires stronger empirical support before it will be ready for standard usage in a wilderness environment. The medications that are most helpful in treating PTSD in a long-term delayed context are selective serotonin reuptake inhibitors (SSRIs),¹⁶ which are inappropriate for delivery in the field due to their requirement for multiple weeks of administration before treatment efficacy.¹⁷

Observation

Following traumatic event exposure, many people experience symptoms similar to those used to diagnose stress disorders, although many of these early responses will

normalize over time without treatment.¹⁸ These early symptoms can often be seen as a normative response to a challenging situation, and should not lead to mental health diagnosis unless they cause clinically significant distress or impairment. One study that concentrated on survivors of an earthquake showed PTSD prevalence declining from 30.2% at 1 to 3 months to 26.9% at 6 to 10 months, then 10.6% at 18 to 20 months.¹⁹ Many of the people studied achieved symptom reduction over time without additional intervention.

Following traumatic events in wilderness settings, observation should be considered a viable mental health treatment option, as in many cases intervention is neither necessary nor preferred by the trauma survivor. When given free access to speak to mental health professionals about their trauma experience, only 10% of trauma survivors choose to do so.²⁰ Explorations of the sequelae of trauma survival suggest that it is a common and healthy pattern to vary between actively processing the trauma and mentally avoiding the trauma.²¹ While trauma survivors should be offered the option of mental health assistance, they have both the right to refuse treatment and a fairly reasonable likelihood of ceasing to meet diagnostic criteria for PTSD over time without formalized treatment.

Psychological Interventions

CRITICAL INCIDENT STRESS DEBRIEFING

CISD is a group-based discussion formatted therapy designed to gather together all emergency personnel who experienced a potentially traumatic event and encourage them to process their experiences.^{10,22} This treatment has considerable face validity, and has previously been very widely used in law enforcement as well as emergency medicine settings.²³ Despite its strong acceptance in many communities, CISD was not strongly empirically researched before it became a widespread practice.²⁴ Further research has strongly demonstrated in randomized, controlled trials that CISD type interventions did not decrease later stress disorder development,^{20,25–28} and, in fact, caused an increased likelihood of developing PTSD at a later date as compared to control participants in several trials.^{15,16} One suggested mechanism for increased PTSD in those who participate in debriefing activities is that the increased amount of time spent dwelling on the various aspects of the trauma leads to additional exposure to traumatizing material.

Due to the lack of empirical support for CISD, it is not recommended following wilderness experiences of traumatic events, and might even result in a higher rate of stress disorders among expedition participants that com-

plete it. In a comprehensive review, McNally et al¹¹ summarize the field by stating that “Although the majority of debriefed survivors describe the experience as helpful, there is no convincing evidence that debriefing reduces the incidence of PTSD, and some controlled studies suggest that it may impede natural recovery from trauma. Most studies show that individuals who receive debriefing fare no better than those who do not receive debriefing.” Further, the American Red Cross emphasizes that CISD is not an approved intervention for their post-deployment workers.²⁹ These findings emphasize that CISD is an inappropriate treatment following exposure to traumatic events.

PSYCHOLOGICAL FIRST AID

The lack of empirical support for CISD has stressed the importance of developing a science-based treatment response to exposure to trauma. PFA is a set of treatment recommendations that has been developed to be consistent with research evidence on surviving trauma.^{12,30} Although PFA has not yet been rigorously empirically tested yet, it has been designed to be a science-based, flexible, applicable, developmentally appropriate set of strategies that will be amenable to scientific analysis. Initial work has shown that it can be delivered in natural disaster settings, as seen in the aftermaths of Hurricanes Katrina and Rita.³¹

PFA is designed to be more individually adapted than CISD, with the burden of initiation of the discussion placed on the trauma survivors who identify an interest in talking to those around them about their feelings. The place of the health professional is to alert trauma survivors of their presence and willingness to discuss the issues, rather than to require discussion from each survivor, as is the case with CISD. PFA is based on 5 basic principles that have empirical support for assisting adaptation after traumatic experiences: promoting a sense of safety, promoting calming, promoting a sense of self- and community efficacy, promoting connectedness, and instilling hope.²¹ PFA’s core actions are collaborative, and emphasize development of the individual’s stress coping skills rather than provision of one particular type of service. The core actions include contact and engagement, safety and comfort, stabilization, information gathering, practical assistance, connection with social supports, information on coping, and linkage with collaborative services.

Pre-expedition training in PFA is recommended to increase the ability of the expedition physician or leader to respond appropriately to stress disorders in the wilderness. The PFA principles are all applicable to wilderness settings, and include many strategies already used

by skilled leaders who work to bond their group together and present obstacles as challenges to overcome together rather than individual barriers.³² The strong background many expedition leaders possess in creating a safe, calm, strong, cohesive group will give them a head start in learning to enact PFA principles. Additionally, many of the PFA core actions can be accomplished through team building interaction and supportive discussion that is a staple of good wilderness leadership. However, several of the PFA core actions are less applicable to wilderness trauma situations, as wilderness response is limited to the supports currently available, rather than allowing for outreach to additional supportive services.

As lack of social support has been targeted as the primary controllable risk factor of later PTSD development,³³ PFA emphasizes providing availability of psychosocial emotional support but avoids any element of required participation that might lead to additional exposure to traumatic details. In wilderness settings, the expedition physician or leader should initiate individual discussions with team members to confirm support and concern, but should follow the team members’ leads in further development of discussion directly targeting the traumatic event. While group discussions about the traumatic event might develop naturally, and might provide a source of shared experience and support, they should not be encouraged to happen if they do not develop organically.

EXPOSURE-BASED TRAUMA TREATMENTS

Delayed psychological interventions for PTSD or ASD that lead to demonstrated clinical improvement in randomized controlled trials all include an element of exposure to the memories associated with the qualifying event, although the type of exposure can vary from in vivo presentation, to imaginal presentation, to virtual reality experiences.^{10,28} The necessary exposure to terrifying events has an expected but often overlooked side effect—PTSD patients often experience an increase in PTSD, anxiety, and depression symptoms after beginning therapy, as they work towards their eventual positive outcome.³⁴

Exposure-based trauma treatments are not appropriate in wilderness environments. Such treatments are complex and involve highly emotionally charged material, and generally they are only undertaken by those with a Master’s degree or higher education in a mental health-related field. Such a professional is unlikely to be available on an expedition. A typical course of empirically validated exposure-based PTSD treatment would include 1-hour sessions weekly for 12 weeks,¹³ which allows

integration of the new views of the traumatic material with the patient's previous life experience. This is highly likely to require more time than the remaining wilderness expedition. Adding the increased stress of exposure-based therapy, with a likely increase in PTSD, anxiety, and depression symptoms, would not serve the probable overall group goal of exiting the wilderness as quickly as possible.

Medication

The amygdala, combined with its many projections to other brain structures, composes a central fear system that processes both learned and unlearned fears.³⁵ This system is necessary to the DSM-IV¹ PTSD criterion of responding to the traumatic event with intense fear, helplessness, or horror. Emotional response is so important to PTSD development that there is evidence that the emotional response matters significantly more than the traumatic or nontraumatic nature of the stressor in predicting disorder outcome.³⁶ Additionally, previous work has shown that following a motor vehicle wreck, increased heart rate on the day of hospital discharge, showing increased emotional arousal, combined with the presence of ASD symptoms predicts later PTSD development.³⁷ Greater fear has been linked to stronger memories, as well as greater physiological arousal, due to increased activation of the lateral nucleus of the amygdala.³⁸ Therefore, alteration of the function of the amygdala is an immediate consideration when addressing traumatic disorders through medication.

BENZODIAZEPINES

Benzodiazepines enhance inhibitory transmission of gamma-aminobutyric acid (GABA), resulting in a decrease in amygdala activation and an increase in acute calm mood.³⁹ Despite its ability to reduce acute activation of the amygdala, benzodiazepine administration does not prevent PTSD development. In fact, a small prospective study suggested that trauma survivors who were given benzodiazepines shortly after their traumatic experience were more likely to develop PTSD than controls.⁴⁰ Perhaps part of their inability to decrease PTSD rates is linked to their overall inhibition of speed and clarity of cognitive processing, resulting in an overall loss of memory,⁴¹ rather than a specific inhibition of emotional memory. This is supported by findings that exposure treatment results in less PTSD symptom reduction for patients who concurrently take benzodiazepines.⁴²

Wilderness-based use of benzodiazepines to treat stress disorders should proceed cautiously. Benzodiaz-

epines are likely to be present in expedition medical kits.⁴³ However, their lack of ability to directly reduce reexperiencing and avoidance symptoms of PTSD decreases their utility,¹⁴ and they should not be given to manage these sorts of symptoms. They can be helpful in managing increased agitation and insomnia, but their general reduction of physiological arousal makes them inappropriate for administration to expedition members who need to complete technical maneuvers in wilderness evacuation. Benzodiazepine use results in increased risk for motor vehicle accidents due to impaired ability to maintain a stable road position,⁴⁴ and it seems highly likely that benzodiazepine use would result also in impaired ability to move through rough terrain safely. It is also worth considering the possible negative outcome of long-term benzodiazepine use following return from the wilderness, especially given their lack of ability to specifically target traumatic symptoms of concern.

PROPRANOLOL

A separate line of biologically based treatment more directly targets the increased arousal elicited by frightening stimuli. The link between increased amygdala activation and PTSD has led to suggestions that administration of propranolol, a drug that blocks beta-adrenergic activity within the amygdala, could decrease traumatic stress development.¹⁵ Several preliminary trials have suggested that acute propranolol administration leads to decreased PTSD symptomatology, even when assessed multiple months later.^{45,46} However, an additional randomized controlled trial demonstrated that propranolol administration immediately following physical injury did not lead to reductions in rates of PTSD development.⁴⁷ A large study on the efficacy and effectiveness of PTSD prevention with propranolol is currently underway (National Institutes of Health Clinical Trials Identifier: NCT00158262).

An additional effect of propranolol, as a nonselective noradrenergic β_1 and β_2 receptor antagonist, is a quick decrease in heart rate, as well as a decrease in cerebral metabolic ratio of oxygen to carbohydrates.⁴⁸ This results in a reduction in cardiac output and decreased cerebral oxygenation during attempted exercise, as well as a lower level of exercise achievement.⁴⁹ Given the strenuous nature of wilderness evacuations, a reduction in exercise ability could cause increased difficulty and danger in safe maneuvering over rough terrain, although general dexterity should not be impaired by propranolol administration, and cognitive flexibility under stress might even be improved by the medication.⁵⁰

As recommendations for medications included in expedition medical kits do not currently include proprano-

lol,⁴³ evidence in favor of its usage in wilderness situations would need to be strong enough to suggest carrying it on expeditions specifically for PTSD prevention. Unfortunately, although propranolol shows great potential promise for reducing traumatic stress symptoms, both in the field and for the long term after the traumatic event, the research is not currently clear enough to warrant changing treatment recommendations to support post-trauma administration of propranolol. Research in this area is developing quickly, and this recommendation should be reassessed following publication of definitive randomized controlled trials in the future.

SELECTIVE SEROTONIN REUPTAKE INHIBITORS

The most effective medication to treat PTSD is long-term administration of SSRIs, because they often reduce or eliminate many of the core PTSD symptoms. SSRI treatment of PTSD results in an average response rate of approximately 60% as compared to placebo response rates of approximately 30%.¹⁶ SSRIs are considerably more appropriate for long-term PTSD treatment than benzodiazepines as they address significantly more symptoms. SSRIs require multiple weeks of administration before clinical improvement is noted for most individuals, as shown in one randomized controlled trial where most responders met response criteria by the fourth week of medication.¹⁷ As with antidepressant treatment of most anxiety disorders, discontinuation of SSRIs following successful reduction of PTSD symptoms results in a relapse rate of 25% and exacerbation of symptoms in 50%.⁵¹ Continuation of SSRIs is important to continued PTSD symptom management.

Wilderness settings are not appropriate for initial administration of SSRI therapy. As is the case with propranolol, SSRIs are not typically included in expedition medical kits,⁴³ so their availability in the wilderness will be limited. As they require weeks of administration before symptom reduction occurs, most evacuations will be complete before PTSD symptoms will begin to respond to SSRI administration. Although 20% of those diagnosed with PTSD taking the SSRI showed a global mental health improvement within the first week, this modest gain was offset by significant increases in insomnia (35%), nausea (28%), diarrhea (23%), fatigue (13%), and decreased appetite (12%).¹⁷ Additionally, although there is not yet conclusive evidence, some research has suggested that initiation of SSRIs induces increased anxiety and jitteriness,⁵² which would complicate wilderness evacuation procedures. The risk–benefit ratio does not support administration of SSRIs in a wilderness environment, when access to more definitive care is likely to be

achieved before significant benefit from the medication is realized. Finally, even if members of the expedition have private supplies of antidepressant medication available, it is inadvisable to deprive someone of an effective dose of medication in order to treat another party member, who might not respond well to the type and dosage of medication, and who is unlikely in any case to show a positive response before evacuation from the wilderness is completed.

Recommendations for Treatment of Stress Responses in Wilderness Settings

When applying knowledge about stress responses to expeditions in wilderness settings, the first concern is identifying those who are at risk. Those who experience physical trauma are at increased risk, but those who observe others' trauma, as well as those who experience near misses, or dangerous situations in which trauma was averted, are also at risk for stress disorder development.⁵ People who show a heightened sense of subjective horror are at elevated risk for disorder development, and should be observed especially closely.² Be watchful for symptoms of stress disorders but also realize that there is variation in symptom development over time. Many people who experience traumatic stressors do not ever develop traumatic stress disorders, and symptoms often resolve over time without any formal intervention.¹⁹

Therapeutic interventions for stress disorders require significant time investment as well as significant training. Care provided in wilderness settings more closely approximates PFA than psychotherapy.¹² Training in the principles and practice of PFA is likely to be very helpful in preparation for dealing with traumatic stress responses in the wilderness. While expressing concern and support to the person with symptoms is appropriate, requiring them to discuss their symptoms is not. Trauma survivors should be encouraged to use their accustomed methods of dealing with stress, and should be treated as expert resources on what types of support will be helpful to them. Finally, although exposure-based therapy is the treatment of choice for traumatic stress disorders,¹³ such treatment requires significant training and experience. It also can result in temporarily elevated anxiety and depression symptoms.³⁴ For these reasons, such therapy should not be attempted until the trauma survivor has returned from the wilderness to a place of comfort and safety.

Medications for treatment of stress disorders in wilderness settings are limited in effectiveness. As multiuse medications, benzodiazepines are often included in expedition medical kits.⁴³ Benzodiazepines can help with secondary issues such as decreased sleep, but they will

not reduce primary PTSD symptoms.¹⁴ Although using propranolol as a preventative medication following traumatic exposure is an exciting idea,⁵³ research on the topic has not been unilaterally supportive,⁴⁷ and is not strong enough at this point to change treatment recommendations. Antidepressants are the best medication available for PTSD treatment,¹⁶ but they are unlikely to be included in wilderness first aid kits,⁴³ are likely to take too much time to develop effective symptom reduction during an expedition, and are likely to result in unwanted side effects.¹⁷

The best plan for managing responses to traumatic stresses in wilderness expedition settings is to seek out training in stress response diagnosis and PFA. A formal manual providing structured guidelines is the definitive work on administering PFA,³⁰ but the manual can be difficult to obtain. However, its core features have been described in easily available psychological literature,¹² and the American Red Cross has created a 4-hour training course that presents the framework of PFA and provides practical education and training exercises to increase PFA competency.⁵⁴ For those who cannot access in-person training, Cloak and Edwards present a brief, accessible introduction to the topic.⁵⁵ Completing PFA training will enhance a wilderness physician's and trip leaders' competency to respond to wilderness disaster situations and create the best possible chance for positive mental health outcomes in adverse circumstances.

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