CASE STUDY: AN OUTBREAK OF VALLEY FEVER

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In July of 2001, a crew of six Student Conservation Association (SCA) students, along with two SCA crew leaders, serving in Dinosaur National Monument (Northern Utah) came down with unexplained flu-like symptoms. These symptoms progressed and within 36 hours, seven of the eight were admitted to the regional medical center for what eventually would be diagnosed as Coccidioidomycosis, more commonly known as Valley Fever. This incident was incredibly intense and stressful for the crewmembers, the members' parents, and SCA staff. Our hope in providing this article to the industry at-large is to increase recognition of the seriousness of Valley Fever and acknowledge its existence outside of its previously defined boundaries. Our other intent is to highlight how SCA's Emergency Response System functioned during this incident. SCA takes risk management seriously and believes that sharing information is the best way to prevent incidents from recurring within the outdoor industry.

Overview of SCA's Emergency Response System

An emergency response system can help an organization respond effectively and efficiently to a critical incident. SCA employs a clearly defined Emergency Response System (ERS) and trains its staff annually in how to utilize the system effectively. In the event of an incident, field leaders are instructed to activate the ERS by calling an 800 number, which is then connected by pager to an on-call staff member (i.e., duty officer). Duty officers rely on the training they receive and clearly defined protocols for how to respond to an incident. One of the protocols defines when to contact other levels of SCA management, from program staff to the CEO and Board of Directors, based on incident severity. Incident severity is categorized into four tiers or "thresholds", Threshold 1 being a minor incident not requiring further communication, to Threshold 4 necessitating the involvement of SCA's senior level management. Throughout the incident previewed in this case study, SCA crew leaders and staff consistently utilized SCA's ERS to manage communication.

Onset of the Illness

On June 19, 2001, a Student Conservation Association crew began their work project at Dinosaur National Monument, 30 minutes east of Vernal, Utah on Highway 40. The first stage of the crew's project was to help archeologists sift through dirt at the worksite to remove archeological objects. The soil disruption caused a great deal of dust to circulate in the air. The crew wore no protective breathing device their first day of sifting, but returned the second day with handkerchiefs to wear over their mouths and noses to mitigate what they perceived to be simple dust inhalation. They exhibited no symptoms on June 19th or 20th, the days they performed the soil sifting.

By Friday, June 29th, all members of the crew were unusually fatigued and noticed shortness of breath. A few members complained of nausea, hives, and chest tightness. Confronted with these symptoms and in light of environmental conditions (100+ degree weather), SCA's crew leaders thought the crew might be suffering from heat exhaustion or that a few crewmembers' allergies might be agitated. The crew leaders treated the crew for heat exhaustion, specific crewmembers for allergies, and monitored the situation for any changes.

Sunday July 1, 2001

By morning, several of the crewmembers' symptoms had increased in severity. SCA Crew Leader No. One activated the Emergency Response System (ERS) by contacting the on-call duty officer, Kris Wright, SCA's Western Crew Operations Director. The Crew Leader reported that she was taking two students into the Ashley Valley Medical Center. At this time, the incident was defined as a Threshold 1 incident, requiring SCA's Western Operations Director to keep detailed paperwork, manage internal communication, and provide logistical and emotional support. The Crew Leader contacted the Western Crew Operations Director again when the doctor had diagnosed one student with heat exhaustion and pneumonia, and the other student with heat exhaustion and muscle spasms in her chest. The Western Crew Operations Director provided the

Crew Leader with moral and organizational support, discussing options including relocating the crew for the night to an air-conditioned hotel. The incident remained at Threshold 1 at this time.

When Crew Leader No. One and the two ill students returned to their base camp they found Crew Leader No. Two and another student exhibiting similar symptoms. The entire crew then relocated to a hotel in Vernal while Crew Leader No. Two and the ill student went to the hospital. During the second round of visits a pattern seemed to emerge. In the past few days the National Park Service's lead archeologist, who had been working with the crew, was admitted to the hospital and his assistant, an SCA intern, had visited the emergency room as well. All ten people exhibited similar symptoms. The hospital thought the cases might be linked through exposure to an unknown environmental agent present at the work site. Due to the nature of the symptoms, they could not rule out Hanta Virus, Coccidioidomycosis, Bubonic Plague, or Tularemia. The hospital began to collect blood samples and chest x-rays for all SCA crewmembers and park personnel that night.

Due to the growing gravity of the situation, SCA Crew Leader No. One was very upset when she contacted SCA's Western Operations Director that evening. Relying on her training and ERS protocols, the Western Operations Director gave emotional support to the crew leader and explained how they would proceed. She gave the crew leader instructions to call her back in ten minutes, giving SCA's Western Crew Operations Director time to activate the ERS and upgrade the incident to a Threshold 3.

SCA's Western Crew Operations Director notified Kurt Merrill, SCA's National Risk Management Director, and Jay Satz, SCA's Vice President of Field Operations, and apprised them of the situation. When they talked ten minutes later, the Western Crew Operations Director explained to the Crew Leader that she [Kris] would remain the primary contact for the crew throughout the night and would keep SCA's National Risk Management Director and Vice President of Field Operations updated as the incident unfolded. The crewmembers called their parents from the hospital and Crew Leaders spoke with most of them at that time.

Monday July 2, 2001

After initial testing at the hospital, all of the crewmembers were diagnosed with pneumonia. Crew Leader No. One called SCA's Western Crew Operations Director at 2 AM to report that the four crew members with fevers were being admitted to the hospital and the other four would go back the hotel for the night and return to the hospital at noon the next day. The hospital called the students' parents in the early hours of the morning to update them on the situation.

In the morning, SCA's National Risk Management Director and Vice President of Field Operations upgraded the incident to Threshold 4, and notified SCA's CEO, Dale Penny, of the situation at-hand. SCA's National Risk Management Director contacted Dr. William Forgey, SCA's medical advisor and Chair of SCA's Board Committee on Risk Management, to elicit his help in assessing the situation. After speaking with the attending physician, Dr. Forgey concurred that the incident was indeed serious and confirmed that the situation was being appropriately managed by the attending medical facility. The National Risk Management Director then contacted the students' parents to discuss the circumstances and provide an overview of the resources that had been mobilized to help manage the situation. One student was from Poland, which made communication with that parent more complicated due to the time difference, long distance phone challenges, and the need for an interpreter.

In Vernal, UT, the medical center involved the TriCounty Health Department and the Utah Department of Health, which subsequently elicited the support of the Center for Disease Control (CDC). Pending an investigation, the National Park Service closed the work site to all visitors and staff, and the TriCounty Health Department alerted the public. The CDC, TriCounty Health Department, and Utah Department of Health began to investigate the risk factors, cause, and extent of the outbreak. The investigators were able to rule out Hanta Virus almost immediately; blood samples were sent to Salt Lake City to try and rule out Bubonic Plague and Tularemia.

Bubonic Plague and Tularemia are highly contagious and transmitted by air, so the hospital took steps to contain potential infection. The admitted crewmembers were secluded and at noon, medical staff met the remainder of the crew outside and escorted them to a secluded room. The crewmembers were asked to wait there for further tests and were required to wear protective face masks if leaving the room. In the meantime, the crew was treated with aggressive antibiotics and antifungals to combat their multitude of symptoms that included difficulty breathing, shortness of breath, cough, headache, skin rash, fever, fatigue, and nausea/vomiting. By mid-day, three additional crewmembers, including Crew Leader No. One, exhibited fevers and were admitted to the hospital. At this point, seven of the eight members of the crew (including both crew leaders) were admitted to the hospital.

Earlier that morning it was determined that on site support was necessary, so by the afternoon SCA's Western Crew Operations Director was on a plane to Utah. SCA's National Risk Management Director remained in the office to manage communication with the parents, the hospital, Dr. Forgey, and key SCA staff. Many parents, due to the nature of the symptoms and a lack of a definitive diagnosis, also began to make arrangements to travel to Vernal. By mid-afternoon it was clear that another staff member would be needed at the scene and SCA's Vice President of Field Operations made arrangements to fly early the next morning.

Tuesday July 3, 2001

When SCA's Western Crew Operations Director arrived in Vernal her primary concern was to connect with the students, the parents already present at the hospital, and the crew leaders. She maintained phone communication with the National Risk Management Director, who served as the conduit of information for the parents en route to Vernal as well as those parents who were not traveling to Utah. The Western Crew Operations Director's role was also to act as an on-site contact for any media arriving on the scene.

While the SCA's Western Crew Operations Director is a trained outdoor professional and risk manager, she had limited media-management training or experience. Via conference call, SCA's Director of Communications and National Risk Management Director provided a crash course on media relations and helped the Western Crew Operations Director prepare for the arrival of media personnel from Salt Lake City. Together they outlined a communication plan and developed answers to anticipated questions. The Western Crew Operations Director then sought out a parent who was willing to speak on behalf of the parents. The hospital's Public Relations/Risk Manager set up a welcoming yet secluded media site where interviews could be conducted away from the patients. The hospital's Public Relations/Risk Manager, a parent spokesperson, her son (the lone SCA crewmember not admitted), and SCA's Western Operations Director gave two television and one radio interview.

Following the interviews, the hospital discharged the students to their parents and SCA, and everyone returned to the hotel. SCA's Vice President of Field Operations arrived that evening and joined SCA's Western Crew Operations Director, the sick crewmembers, and numerous parents for three days of recovery at the hotel. During this time SCA's Vice President of Field Operations and Western Crew Operations Director stepped in to provide leadership for the recovering crew leaders and students as they rested, ate, took their medications, and prepared to travel home.

SCA's Vice President of Field Operations and Western Crew Operations Director also met with local Park Service officials and visiting health professionals during this time. They had numerous meetings with Park staff to stay abreast of current information and coordinate the program's closure. On Thursday July 5th, they participated in a debrief meeting co-facilitated by the CDC and Utah Department of Health personnel. In this meeting the CDC and Ashley Valley Medical Center committed to provide information and documentation for the crewmembers' families and personal physicians. SCA agreed to assume the role of parent/student advocate and information conduit moving forward through the next phase of the investigation. On Friday, July 6th, SCA's Vice President of Field Operations and Western Crew Operations Director conducted an information debrief with the crew leaders. Saturday, July 7th, the students left for home and the on-site management of the incident was closed.

The Case Study

In the preliminary report on July 5th, the CDC identified Coccidioidomycosis as the most likely cause of illness, and on November 16th, the CDC published its final report supporting its preliminary diagnosis.

Up until this series of illnesses, Coccidioidomycosis was not identified as endemic to Northern Utah, found no closer than 200 miles south of Dinosaur National Monument. As Doctors Kirkland and Fierer explain in *Coccidioidomycosis: A Reemerging Infectious Disease* (see references at the end of this article), Coccidioidomycosis is caused by *Coccidioidesimmitis (C. immitis)*, a dimorphic fungus that grows as a mold primarily in desert soil. The fungus is present in high numbers in California's San Joaquin Valley, southern Arizona, southern New Mexico, west Texas, and the desert areas of Northern Mexico. It is also found scattered in coastal southern California, southern Nevada, and [southern] Utah. *C. immitis* infects humans and animals almost exclusively via the respiratory system.

Kirkland and Fierer explain that in symptomatic patients, the illness ranges from a flu-like illness to pneumonia. Symptoms may appear as blood-tinged sputum, loss of appetite, weight loss, wheezing, excessive sweating, altered mental state, light sensitivity, and edema in the legs, joints, and feet (for additional symptoms see OCnow.com). Kirkland and Fierer also note that the number of reported cases is proportional to the different seasons, being highest in late summer and early fall when the soil is dry and dust levels are high. Exposure to dust is a critical risk factor, and therefore reducing dust exposure is a primary step in reducing the risk of illness, according to Kirkland and Fierer.

The CDC determined that the outbreak at Dinosaur National Monument was linked to the workers' exposure to large amounts of contaminated dust while sifting dirt (see reference at the end of this article for more information on CDC's findings). The work crew should not have been sifting soil without proper respiratory protection.

Conclusions

There were many factors that played a part in successfully managing this complex incident. The crew leaders' medical training and leadership skill prompted them to respond quickly and appropriately to the situation. The crew was located in the front country and close to vehicles, phones, and medical assistance. The crew leaders and staff were adequately trained and successful in utilizing SCA's ERS. The technology reliably connected the crew leaders to the duty officer. The ERS protocols and thresholds were clear and prompted correct action even in the most stressful stages of the incident. SCA knew its staff members' strengths and mobilized appropriate members to compose the on-site support team.

Externally, SCA was allied with competent and helpful partners. The Ashley Valley Medical Center professionals were knowledgeable, compassionate and treated SCA's members with a high standard of care. The CDC, TriCounty Health Department, and Utah Department of Health were swift and effective in their investigation. Dinosaur National Monument's Park Service staff continued to demonstrate their support of the crewmembers and their longstanding partnership with SCA. The TriCounty Health Department was helpful in proactively managing the media. And the town of Vernal welcomed SCA participants and parents as they weathered the illness in its community.

It is important that the outdoor community shares information about environmental agents like *C. immitis* to help prevent a similar situation in the future. It is easy to see how seemingly innocuous "flu-like" symptoms can rapidly progress into a serious illness, and how an incident could increase in complexity if moved further into the backcountry. When incidents like this occur, training and a solid emergency response system can provide the foundation from which your staff can respond effectively, appropriately, and consistently to a critical incident.

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