The Communication Triangle: Elements of an Effective Warning Message

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The lack of good communication is a very real problem in mine emergencies. Sometimes critical information is not communicated to those who need it to make decisions. At other times, those on the receiving end of a warning do not think to ask the right questions. What happens in underground coal mine fires is a case in point. The authors interviewed 48 workers who escaped three serious fires in western Pennsylvania. In each case the location of the fire was known but did not get communicated to many of those who had to evacuate. Sometimes, even the nature of the problem was not clearly communicated. Some workers began their evacuation knowing nothing about what was happening. In an effort to improve emergency communication National Institute for Occupational Safety and Health (NIOSH) researchers worked with safety professionals to determine what sorts of information are critical in a mine emergency. An extensive list was generated, which proved too long to be remembered by individuals. The list was therefore collapsed into six categories. A communication protocol was derived from these categories.

THE COMMUNICATION PROTOCOL

To counter communication breakdowns, researchers at the NIOSH Pittsburgh Research Laboratory developed the Emergency Communication Triangle. It is a training intervention designed to help those giving a warning to provide the right sort of information and those receiving a warning to ask the right questions. The Triangle has six ordered components (who, where, what, miners, event, and response) with the first three considered most important:

Who?—When reporting an emergency or receiving a warning, the first thing to do is identify yourself. This is important because people react differently based on who gives them information. For example: Think about the different reactions that might happen in this situation: Someone calls the site communications person and says "There's a fire at the Three Left head drive! Get help!" What would the communications person do if the miner making that call had been a member of the site's fire brigade for 15 years and was known as a calm and level-headed person? Would the communications person react the same way if the individual making the call was a young, inexperienced miner who had only been working for a month?

Figure 1—The emergency communication triangle decal.

The communications person will act much more quickly based on the warning given by the fire brigade member than on that given by the inexperienced miner. In the second case, the communications person will probably look for confirmation of the problem from someone more experienced. When people receiving a warning do not know who it is from, they are likely to try and gather more information before acting. Important time can be lost during this process. When providing a warning, make sure the person you are talking to knows who you are.

Where?—Next, determine the location of the problem if you are receiving a warning; provide the location if you are giving a warning. This may seem like common sense, but it doesn't always happen. One day the communications person at a large underground mine received a call from another miner who said, "There's a fire on the belt!" The person making the call then took off to start fighting the fire. The communications person was left knowing only that there was a fire somewhere on the mine's more than seven miles of underground conveyor belt. The communications person's first task became to find out the location of the problem, rather than to start responding.

Another example comes from research conducted on three underground mine fires that forced the evacuation of more than 60 miners through smoke. A total of 48 were interviewed and asked about their experiences. Only two knew the location of the fire as they were escaping.

That was unfortunate because this information was known by either the dispatcher or the person who discovered the fire. As the result of this non-communication, miners had to make decisions about escape routes without knowing the source of the problem. This lack of knowledge also increased the stress of the situation because they didn't know how far they would have to walk to find fresh air.

What?—Next, tell exactly what is happening. Again, this may seem like common sense, but it does not always happen in an emergency. During one serious mine fire, a warning message was given for everyone on the section to evacuate. Miners who had been near the phone when the call came in went to gather the others on their crew. One of these miners yelled to an equipment operator saying, "Come on down to the dinner hole. We're going out." Since the haulage belt was down and it was close to quitting time, the machine operator and his helper thought they were just leaving the work area a little early. They went through their normal end of shift routine which included shutting down and parking their equipment. As a result, valuable time was lost.

Although the second trio of steps are considered less important than determining who, where, and what they are not trivial. Attention to these details will provide a most effective warning message.

Miners—The next step is to assess which miners are (or will be) affected by the problem. Is anyone hurt? Has everyone been accounted for? When and where was a missing person last seen? If someone may be in trouble, make them the highest priority by reporting what you know.

Event—Miners should assess the event as it is unfolding. A person reporting the problem ought to provide information about the severity of the situation, for instance. Will a fire extinguisher be sufficient, or will a foam generator be needed?

Response—Finally, it is desirable to report what has been done so far. (No need to duplicate efforts.) How many

people are on the scene? What equipment is on scene? Be specific. At one mine emergency, responders called a neighboring mine and asked for help in the form of scoop batteries and chargers. In response, the neighboring mine sent all the extra cap lamps and batteries that they had on hand. Somewhere in communicating what equipment was needed, the request for scoop batteries and chargers was translated into cap lamp batteries and chargers. Time was lost because the request for what was really needed had to be communicated a second time and the right materiel finally sent.

EMERGENCY COMMUNICATIONS TRAINING MATERIALS

The Emergency Communication Triangle is packaged as a short safety talk to be given by supervisors at the start of a shift. The package consists of a brief instructor's guide and an advance organizer to help workers remember the most important aspects of the safety talk. The objective of the talk is to inform miners about the importance of effective emergency communications and to teach them the six steps of the protocol discussed above. The information can be presented in about 15 minutes and is appropriate for miners at all levels of experience. As a reinforcer, the training package also contains a triangle sticker that can be placed on the miner's cap and is intended for use as a mnemonic device during an emergency (Figure 1).

TESTING THE TRAINING PACKAGE

The package was first field tested in 1998 with a group of 236 workers at an underground coal mine in Colorado. Prior to the talk, miners were asked to list the types of information that should be included in an emergency warning message. This exercise was followed by the safety talk, and each miner was given an Emergency Communication Triangle sticker. Ninety days after the safety talk, in early 1999, researchers returned to conduct a post-test evaluation. As Figures 2 and 3 show, there were modest gains relative to each step of the communication protocol. In all six instances, a larger percentage of miners reported they would relay category-specific information in an emergency.

The safety talk was adopted by the mine and used repeatedly over the ensuing years. Two additional follow-up visits were made in 2003 and 2004 to assess

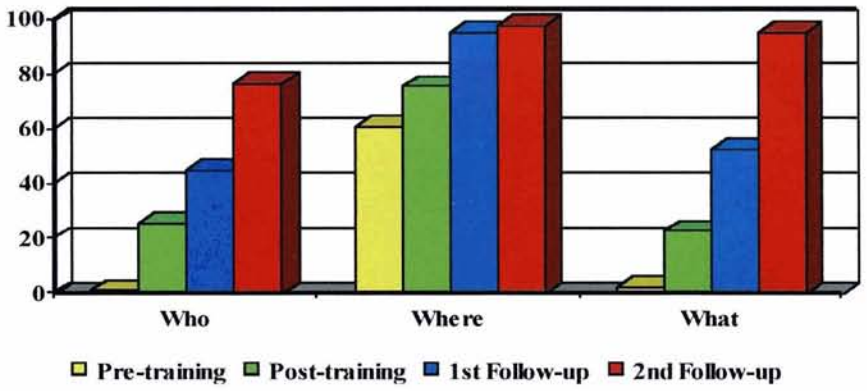

Figure 2—The critical components of an effective warning message.

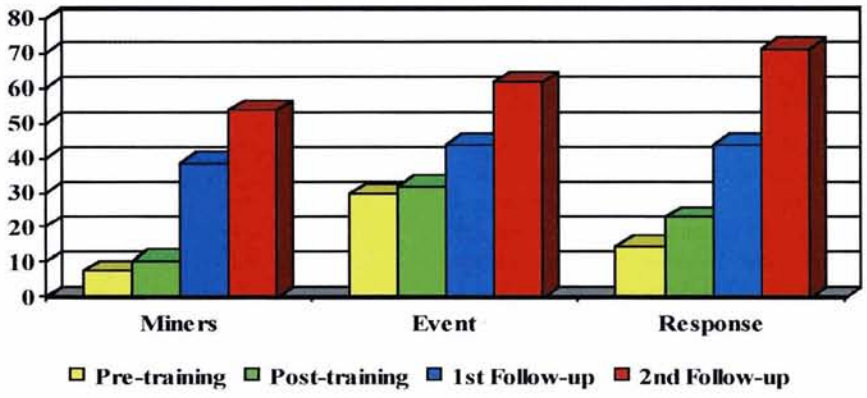

Figure 3—The secondary components of an effective warning message.

progress. Both times the workers were given this task: "Imagine you are working alone and discover a fire. You go to the nearest phone to sound the alarm. Think about the sorts of things you might say in your warning message. Then please list the information you would give in the order you would give it."

In the first follow-up (2003) there were again increases across the board. More than 90% of the miners now reported they would give the location of the problem (Figure 2). Since location is one of the most critical pieces of information, that is an encouraging percentage. Unfortunately, as the graph shows, less than half reported they would identify themselves and only half indicated they would relay what the problem was. As for the secondary concerns, while the increases were dramatic, less than half the workers reported they would relay who was affected, the extent of the problem, or what response they planned to make (Figure 3).

During their 2003 visit, after data collection was complete, the researchers themselves gave a safety talk to all three shifts. In this talk they stressed the importance of effective communication in an emergency. They also showed a short video that they had added to the training package. It discussed the Communication Triangle protocol. The mine's safety director stated that he intended to use the video in annual refresher classes.

The largest increases occurred between 2003 and 2004. By 2004, almost 80% of the workers indicated they would identify themselves, and well over 90% reported they would now say what the problem was (Figure 2). The Who, Where and What portion of the protocol was fairly well covered. As Figure 3 shows, there were commensurate gains on the secondary portion. Now, more than half of the miners would report who was affected by the event, 60% would say something about the severity of the situation, and a full 70% would report what had been done so far. While there is still room for improvement, the gains are encouraging.

AUTHOR INFORMATION

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