

Mental Health in the Atomic Energy Research Institution

–From the Viewpoint of Occupational Physician–

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From the perspective of an occupational physician in the Japan Atomic Energy Agency, we observe the work environment and employee stress caused by changes in the environment and introduce necessary ideas and activities in the agency for maintaining psychological health and high motivation in a difficult environment. Further, we discuss the effect of the Great East Japan earthquake on the Japan Atomic Energy Agency and its employees.

I. Introduction

We have been working as occupational physicians in the Nuclear Fuel Cycle Engineering Labs (NFCEL) at the Japan Atomic Energy Agency (JAEA) since 2003. The NFCEL carries out research and development on nuclear fuel manufacturing and reprocessing and geological disposal of the spent fuel. Many might think that the main role of occupational physicians at such workplaces is providing healthcare for harmful jobs such as radiological processes (I was one of them at first). However, just like any other workplace, the mental health of employees affects the workplace and half of our time is spent on addressing mental health issues.

An article on mental health in a nuclear science and engineering journal might seem slightly out of place; however, as an occupational physician in the nuclear power industry, we think mental health issues cannot be ignored in order for the nuclear power industry to play its expected role in Japan and around the world. We hope that this article will contribute to the improvement of workers' mental health in these industries.

II. Stress of Workers in the Nuclear Power Industry

1. Characteristics of Stress

What are the characteristics of stress among employees in the nuclear power industry? A general concern is the fact that the employees work near radioactive materials with a risk of

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exposure to radiation. However, apparently, since the frequency of nuclear emergencies is not very high, the risk of exposure is not a direct cause of stress. Here, we discuss three major stresses among employees that are raised when interacting with them every day.

The first is “increasing work with limited human resources and budget,” which is common in other workplaces as well. The second involves the physical and psychological stress caused by a drastic change in the quality of work expected for an employee in the past few years. The third involves the stress associated with the strict management standards and rules that are in place because any abnormal event or accident can cause serious damage to the residents and the surrounding environment.

2. Limited Human Resources, but Increasing Work

This issue is not limited to the nuclear power industry but is also the case in other workplaces. The members of our research group are occupational physicians in various workplaces such as educational research institutes in Tsukuba Science City. All workplaces have problems in dealing with mental health issues despite increasing workloads and limited human resources and budgets. We think that there has been some knowledge in this regard based on previous research results.

One such example is the large-scale epidemiological survey regarding stress in the workplace held once every five years for educational research institutes in Tsukuba Science City. The Tsukuba Science City hosts many governmental educational research institutes, and the number of researchers is exceptionally high compared to those in other communities in Japan.

This study revealed an interesting result in comparing employees in administrative jobs with those in research jobs in particular. While the workload of quantity and quality are a major burden on those in the research field, they felt a sense of accomplishment and discretion, indicating that they were in a better mental health condition than those in administrative fields. A covariance structure analysis revealed that stress-revealing factors such as discretion and fulfillment had three times as much of an effect on psychological health indicators as stress-causing factors such as quantitative and qualitative burdens. In other words, providing a sense of fulfillment has three times the power in terms of reducing stress as reducing work.

Since the way to provide discretion and a sense of fulfillment varies depending on the workplace and job category, this method cannot be generalized. However, as a key, being aware of the effort–reward imbalance model, personnel should be managed such that effort and reward are balanced. Stress occurs when there is an imbalance between “reward” and “work demand” or “effort.” Work demand pertains to the difficulty in work and level of responsibility and burden. Even if one has work with a high burden, subjective stress can be reduced if reward meets effort. In contrast, stress is felt when an insufficient reward is given compared to the effort. One example is a case wherein many labor hours are wasted due to a change in the direction. Reward in the effort–reward imbalance model includes not only monetary and carrier rewards but also recognition from superiors, colleagues, and external organizations as well as the “mental reward” gained from having challenging and meaningful work. Therefore, it is extremely important to work out a way to evaluate not only the results of work but also the process of making effort.

3. Rapid Change of Expected Work

The second factor is that the quality of work expected from employees has been rapidly changing in the past few years. The NFCEL deals with operations related to nuclear fuel

manufacturing and the reprocessing of the spent fuel as part of the national policy. This means that there are many employees who manage and operate the processes on factory lines, i.e., on-site jobs. However, with the technology transfer to private companies, research and development has been required for future generations and employees spend more time at their desks thinking over what their own value is.

In addition, the seismic resistance of facilities has recently become an issue. Many employees have said that “we have always been working on operational duties, but now we have to perform unfamiliar work, such as seismic resistance inspections and safety standards examinations.” Due to this, the quality of work has changed significantly, causing much stress among employees, and then not a few of them were physically damaged. Work that requires a high level of expertise and confidentiality, such as that concerning nuclear power, requires workers to be in a specific field for a long period. In other words, it is not that employees have low ability to adapt. The very nature of the work makes the adaptation to other environments difficult.

Also, there are no existing standards in nuclear safety, which causes a qualitative burden in terms of responding to ever-changing conditions. It is desirable that occupational physicians understand the work environment and employee’s problems and provide advice based on their aptitude and background in a way that the overall productivity of the workplace will improve. However, such environmental adjustment is difficult if the work has multiple aspects. It is irritating that occupational physicians can only promote communication between the employee and the workplace and support them so they can understand each other’s problems and are more motivated in their jobs.

4. Stress Specific to the Nuclear Power Industry

The third stress involves various events that occur in the workplace, but can actually be caused by the atmosphere at the workplace. It is understandable that “accidents” cause stress, but there is a reason that we use the word “events.” In the world of nuclear power, there is an atmosphere to not even induce “events” that would rarely lead to serious accidents, as the effect of an “accident” is so serious.

Of course, there are not frequent occurrences of events or accidents, and such occurrences should be avoided, but such atmosphere is inevitable considering the possible effect of a nuclear emergency. However, we once had the impression that some employees who work with possible danger feel like they “should not feel the stress to security and safety” and unconsciously suppress their stress. This is not desirable from the viewpoint of occupational psychology. When common stress exists in a group, it is very important for the individuals to recognize it and share the recognition of the cause of stress in order to maintain their psychological health.

The mutual understanding of each other’s stress leads to mutual trust. Not knowing what others think and feel prevents one from building relationships with them and has a negative effect on their psychological health. Of course, the cause of stress cannot be solved simply through mutual recognition among those involved. Yet, anybody may have experienced their mind clearing up after sharing their problems or feeling stress relief after finding out that others have the same issue. In organizations as well, recognition and discussion of stress factors among the employees not only improves their stress resistance and maintains their mental health but also clarifies the weakness of the organizations and prevents trouble.

Recently, there has been active effort toward risk communication. We hear that anxiety can be reduced by not only explaining safety to the surrounding residents but also by actively

discussing the risks. Feeling safe is an emotional issue that requires not only the knowledge and observation of effort but also the establishment of trust among those involved.

Regardless of their job type (administration, technology, or research), most workers in the nuclear power industry exert themselves in their roles in fulfilling the role expected of nuclear power in the world. Hence, while each individual has a strong sense of mission and responsibility, they might unconsciously feel like they cannot show weakness. However, resemble as risk communication within the surrounding residents, we feel the necessity of small-scaled risk communication within the workplace in order to establish mutual trust.

III. Effort in Maintaining Motivation

Under such difficult circumstances, there are new activities conducted by the staff from human resources departments and industrial health for employees so that they can maintain psychological and physical health and perform with high motivation. This is not a conventional mental health effort as part of illness countermeasures but an effort to actively improve motivation.

The central concept of this activity is sense of coherence (SOC). This concept is the opposite of the pathogenetic idea that asks “why one becomes ill,” and originates from the salutogenetic idea that asks “why one remains healthy?”

This is a concept born from research by a Jewish American health/medical sociologist Aaron Antonovsky (sociology) and Jewish people, who have had extremely harsh experiences in concentration camps, as subjects. He studied women who maintained their psychological health even under the ultimate stress caused by a possible massacre in a gas chamber and used the experience as an opportunity to grow as a human and to live a positive life. He studied how they were able to deal with such stress under a harsh environment.

Given a certain cause of stress, SOC consists of a sense of meaningfulness, a sense of comprehensibility, and a sense of manageability. A sense of meaningfulness is the ability to face events positively, without which one tends to not work seriously and rather to work passively when not understanding the meaning of one’s job. In contrast, a high sense of meaningfulness enables one to work even on tasks in which one is not interested, with the mindset that it will be useful someday. A sense of comprehensibility is the ability to understand the situation one is facing and predict the consequences. A low sense of comprehensibility causes one to focus on the issue itself with a mindset that the problem will persist forever. A high sense of comprehensibility enables one to see through the situation and subjectively and objectively reduce the effect of current and future stresses with mindsets such as “it will be better next week” and “I will seek advice now since I am busy next month.” The sense of manageability is the ability to think that it will be fine, even in situations where the future is not certain. A low sense of manageability causes one to have low esteem in their past accomplishments, with mindsets such as “I have just been lucky” and “I am not sure if I can do it in the future.” A high sense of manageability enables one to understand what can and cannot be done using previous experience and what preparation and effort are needed.

There is active research in a sense of coherence, and individuals with a strong sense of coherence can not only reduce risk of mental and physical malfunction but also maintain sociological health.

Such a sense is particularly important for employees in the nuclear power industry. As mentioned above, since it is difficult to find the meaning in one’s job in the nuclear power

industry and long-term commitment sometimes blinds one to the situation one is in or in regard to how to proceed with the given task, it is important to understand whether work is referred to and employees are educated based on the sense of coherence.

In general, to increase the sense of meaningfulness, it is effective to work by feeling a sense of purpose through the meaning and significance of work and its prospect. The sense of comprehensibility can be raised by presenting the outline of work and grasping the whole scope of work. The sense of manageability can be raised by sharing words of support such as “you accomplished this much last time” and “this time, you can make this kind of effort.”

This activity has just started, and we are both hopeful and uncertain about it, but we aim to make it effective through trial and error.

IV. Changes Brought by the Great East Japan Earthquake

1. Environment of the Employees

In writing an article about nuclear power, one cannot avoid mentioning the tremendous earthquake that occurred on March 11, 2011. At first, Ibaraki prefecture was not recognized as a disaster area, and the conditions were not accurately reported in the news. We went over to the site shortly after the earthquake and felt the magnitude of the damage caused by the earthquake when we witnessed the conditions in Ibaraki (damage varied largely throughout Ibaraki). Like many, our thinking process also changed after the earthquake. After the earthquake, our way of thinking has greatly changed so that they would not think of before the earthquake, such as traffic conditions or whether related companies will correspond as usual, which prevents appropriate decision-making. Of course, the damage caused to the facility and infrastructure of JAEA was tremendous, and all the effort was given toward protection and management of the facilities under our jurisdiction. Even a few months after the earthquake, there were facilities and projects that needed restoration.

As for the issues related to the nuclear power plant in Fukushima, JAEA is a designated public corporation with expert knowledge in nuclear power that has been providing various means of support (Fukushima support) after the earthquake, which has been causing new sources of stress. Therefore, we have started organizational activities besides individual consultation in order to provide appropriate healthcare management.

Based on consultations with the employees, we gathered the impression that the employees feel like “we cannot prioritize ourselves in a difficult situation,” “this is the time JAEA fulfills its mission,” and “the effects on us are lighter than those on the residents heavily affected by the earthquake.” This shows that the employees have a high sense of motivation, but could also mean that they are suppressing their stress and working without recognizing the sacrifice they are making.

Even under normal operations, during the time after late April to early May (Golden Week) and during June, many workers show the signs of fatigue that have accumulated since the new year as well as mental and physical illness. Therefore, following the earthquake, we increased the opportunities for healthcare consultations with employees, but surprisingly, there were not so many voluntary requests for consultations at the end of June. It could have been that the employees maintained their motivation and kept working on their tasks in high mental and physical health, but once we talked to them, many started to share the stress that had been accumulating. They might have been related to the feelings described above, wherein they thought that “we should not make complaints.”

Such a mentality is necessary for overcoming acute phases, but it is almost impossible to maintain such tense conditions for a long period of time. In fact, a week or two after the earthquake, we recognized signs of psychological and physical fatigue and gathered the impression that the quality of work also decreased. During such stressful events, psychological states vary since the workers have difficult conditions and roles to play with both work and family. Also, there are many who focus on their task, ignoring the stress. As a result, workers are concerned with the earthquake, but nobody is willing to talk about it. We would like to discuss the risk caused by suppressing one's feeling, through a case study (see below).

Case study

After the earthquake, a 40-year-old male came for a consultation about his family. During the earthquake, he worked in department of safety and health, and after the earthquake, he was assigned to the emergency headquarter, which prevented him from going home for several days. His workplace was damaged, but the damage to his house was also significant, and the electricity, water, and phone lines were disconnected. He could not contact his family (his wife and child in elementary school) for several days, but he prioritized his work given his position at work. Three days after the earthquake, he found out through his colleague that his family had fled to a nearby evacuation center, and one week later, he reunited with them, and his wife broke into tears.

Even after returning home, he was too busy with work and could not help with domestic chores. His wife has to face the fear of aftershocks on a daily basis, wondering "what to do if another strong quake occurs."

The situation is slowly returning to normal, but his wife sometimes cries after she sees him or the child off. He wonders "how to comfort her" or "what to say to her".

This is likely a case where an emotional distress occurred due to the inability to share the anxiety and fear from the earthquake with the family and due to suppressing such emotions. His wife was experiencing mental and physical stress from the fear of earthquakes, the uncertain safety of her husband, and the inconvenient evacuation to protect the child. She was likely relieved to find that her husband was safe and able to return home. After she resumed a normal life of sending off her husband and child, she likely suffered the fear of not seeing them again due to an earthquake, resulting in her crying. We let the employees take their time and talk about their feelings, such as "It must have been really difficult for you after the earthquake" and "It's back to normal now, but it's scary to think that another earthquake can separate us from family, isn't it?" After they were mentally calm, we advised them to make specific measures for emergencies such as communication methods and setting meeting places.

There will likely be demand for individual consultations from the employees. It might also be necessary for industrial health staff members to hold a small-scale lecture for each workplace, where employees can share what is causing them stress.

2. Responding to Changes in Expected Roles

Support for Fukushima involves phone consultations, on-site environmental monitoring, delegation of human resources for the government, coordination of temporary return to home, and lectures on nuclear power in communities. However, the situation is changing every day.

Phone consultations involve answering phone calls from outside, just like a customer

service center in a company. The questions range from open-ended questions such as whether their location is safe or what to do to specific ones such as a request for a radiation measurement in their house, and whether the food is safe. They also include emotional expressions such as “how you are going to take responsibility” and “hold consultations on the site.” The number of consultations increases following TV reports on certain food and communities, and the quality of questions increases with residential knowledge regarding nuclear power. Many consultations end with words such as “I am relieved” or “thank you” when the concerns are heard and addressed based on the person’s background. However, the operators cannot hang up the phone, some consultations last for a few hours, and some employees take the client’s emotions personally, which results in significant psychological stress, headaches, insomnia, and depression. Workers who take on this task have broad knowledge about nuclear power, and have to suspend their own work, which is highly limiting. Departments with facilities need several workers for protection management, even during machine down time. Also, there are employees who have knowledge and experience regarding radioactive materials but have a difficult time addressing the various questions from the residents. Therefore, certain employees take on most of the tasks, increasing psychological stress, and need psychological and mental support.

The NFCEL regards the Fukushima support as a “task that needs healthcare management,” and the organization has started to provide support. Specifically, before and after Fukushima support tasks, the department and industrial health staff carry out health checks via questionnaires in an attempt to detect health issues. Since it is impossible to draw conclusions simply by using questionnaires, industrial health staff and departments communicate in regard to this initiative, make individual risk assessments, and develop activities for Fukushima support (days of service, number of services, and necessary follow-up system).

Even amid writing this paper, employees are receiving new requests one after another, indicating that the expected tasks can change in the future. In the past, JAEA had to validate its significance, but following the earthquake, the public has expectations from the agency. This, in part, has a positive effect on employee motivation. However, support for Fukushima will likely be a long-term effort, and the voluntary nature of the current support tasks will not sustain employees’ motivation. Under such circumstances, many do not spare cooperation but struggle with finding what they can do, and it is necessary to examine how to engage them. In fact, some employees cannot work on their original assignments, and are concerned with how long the situation will last and wonder when they can start working on their original assigned work. The Fukushima support office that was newly established in May, 2011 became one of the duties of JAEA. This necessitates the continuous motivation of the employees.

V. Conclusions

Here, we have provided a summary of the environment of JAEA and its changes from the viewpoint of occupational physicians. The environment surrounding the employees varies due to many factors, which requires them to adapt to rapid changes, causing significant stress. However, what has been written in this paper is not just contained in our minds. We have started to communicate our opinions to managerial personnel and employees and hold necessary discussions. In closing, we promise to continue taking proactive steps to invigorate the employees in the field of nuclear power from the viewpoint of occupational physicians.

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