

Case Study

Continuous improvement of fitness-for-duty management programs for workers engaging in stabilizing and decommissioning work at the Fukushima Daiichi Nuclear Power Plant

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Abstract: Background: Numerous workers have participated in recovery efforts following the accident that occurred at the Tokyo Electric Power Company (TEPCO) Fukushima Daiichi Nuclear Power Plant after the Great East Japan Earthquake. These workers, belonging to various companies, have been engaged in various tasks since the accident. Given the hazards and stress involved in these tasks and the relatively long time required to transport sick or injured workers to medical institutions, it became necessary to quickly implement a more stringent management program for fitness for duty than in ordinary work environments. **Case:** It took considerable time to introduce and improve a fitness-for-duty

program because of several concerns. Various efforts were conducted, sometimes triggered by guidance from the Ministry of Health, Labour and Welfare (MHLW), but the implementation of the program was insufficient. In April 2016, a new program was initiated in which all primary contractors confirmed that their subcontractors had achieved five conditions for workers' fitness for duty on the basis of guidance from the MHLW and occupational health experts. TEPCO confirmed that all primary contractors had implemented the program successfully as of the end of November 2016. **Conclusion:** Following a disaster, even though the parties concerned understand the necessity of fitness-for-duty programs and that companies in high positions have responsibilities beyond their legal requirements, it is highly possible that they may hesitate to introduce such programs without guidance from the government. It is necessary to prepare a governmental framework and professional resources that introduce these stringent management programs quickly.

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Introduction

After the Great East Japan Earthquake and Tsunami in March 2011, a major nuclear accident took place at the Tokyo Electric Power Company (TEPCO) Fukushima Daiichi Nuclear Power Plant (NPP). Since the accident occurred, a large number of TEPCO workers, manufacturers of nuclear reactors, construction companies, and their contractors have been engaged in stabilizing and decommissioning work. Among them, many were workers temporarily hired from all over Japan, and it was expected that people with various health conditions would be among these¹⁾. Meanwhile, the work these workers were engaged in at the NPP in the early phase included stressful and hazardous tasks that require various types of personal protective equipment²⁾. As for the medical system, it took a relatively long time to transport sick or injured workers to secondary emergency and tertiary emergency hospitals³⁾. When considering these facts, it was necessary to implement more stringent rules for the evaluation and management of fitness for duty than is typical in ordinary work environments.

In this case, programs for new workers at registration and for other workers with periodic health examinations had been implemented. However, owing to burdens on TEPCO and primary contractors, a shortage of occupational physicians around the disaster area, and other inhibitory factors, it was necessary to improve the programs step by step in accordance with the occurrences of cases of severe illness and governmental guidance over 5 years.

When a major disaster occurs, workers and volunteers with various types of employment arrangements work under a complex organizational structure. It is thought that the experience gained from this NPP accident will provide lessons for establishing occupational health systems and delivering programs when a major disaster occurs in the future. Therefore, we report on the development of programs to manage workers' fitness for duty.

Case Presentation

Background

In the stabilization work at the NPP, TEPCO contracts out various tasks to primary contractors, and each of these in turn outsources parts of tasks to multiple layers of subcontractors. As the phase shifted to decommissioning work, the numbers of primary contractors and workers on site per day increased. As of February 2017, about 40 primary companies were involved, and there were about

6,000 workers on site per day during the period between November 2016 and January 2017. The number of registered workers during this period was about 9,700, and about 11% of them were TEPCO employees and the others were those of the contractors⁴⁾.

Most of the authors of this study participated in first aid services coordinated by the University of Occupational and Environmental Health, Japan (UOEH) in a quake-proof building at the NPP from May to September 2011²⁾. Since May 2011, most of the authors have also participated in the occupational health experts' meeting, in which occupational health experts of the UOEH and occupational physicians of TEPCO and some primary contractors periodically discuss the situation and challenges of occupational health activities in each organization. The meeting provided necessary recommendations to TEPCO to ensure the health and safety of workers in the NPP. In addition, some of the authors also participated in the NPP's hygiene representatives' meeting and provided necessary information to secure the health of the workers¹⁾. The meeting was established under the NPP's safety promotion liaison meeting in December 2012, and TEPCO shared the related information with hygiene representatives of primary contractors and supported them to implement occupational health programs effectively for their subcontractors. Therefore, we were in a position to know the facts about the health-management problems and countermeasures within the NPP.

According to Japan's Industrial Safety and Health Act, an employer is only obligated to provide general health examinations and work accommodations on the basis of the results of health examinations if necessary to employees who are directly hired by the employer. Since there were no specific fitness-for-duty requirements for nuclear plant workers in Japan, the general health examination was an essential opportunity to assess workers' fitness for duty at the NPP. To unitarily manage the doses of radiation exposure of workers working at multiple NPPs, the Radiation Effects Association, in coordination with electric power companies and their contractors, operates a radiation dose registration system under the guidance of the government⁵⁾. However, the general health examination records were not confirmed in a unified manner when new workers were registered before the accident, although a significant proportion of primary contractors had requested subcontractors to submit them.

Just after the accident, exposure to radiation was the greatest concern, but later, reductions in radiation exposure had achieved a maximum dose of 48.80 mSv and an average dose of 3.32 mSv in May 2011, down from 670.36 mSv and 21.57 mSv in March, respectively⁶⁾. And then, heat illnesses were considered to be the greatest occupational health risk. The Ministry of Health, Labour and Welfare (MHLW) issued a guidance document to employers mainly in regard to countermeasures against

heat illnesses on June 10, 2011⁷⁾. The guidance included requests that health-care efforts be undertaken such as supervisors checking the daily health conditions and risk of heat illness of each individual, and that employers take appropriate measures such as a restriction of working hours.

Enhancement of Fitness-for-Duty Management Programs

1) “Work permitted” assessment by a doctor as a condition in new worker registrations

The authors, with the support of the UOEH, made various recommendations to the government and TEPCO on occupational health management other than measures of radiation and heat exposure in May 2011. As a part of these recommendations, we suggested to implement a program in which a doctor’s confirmation of fitness for duty would be a requirement for the registration of a new worker. On that occasion, we also pointed out several health conditions that needed special attention, such as a poor control of diabetes and hypertension, the use of diuretics, infectious diseases such as tuberculosis, and the risk or past history of sudden unconsciousness.

Meanwhile, because cases concerning fitness for duty such as tuberculosis and heart failure continued to occur, the importance of individual health care and managing fitness for duty in particular was understood. However, addressing these issues was postponed because of concerns that it would be difficult to thoroughly enforce the program for all contractors and that registering workers would be complicated. There were also concerns that the restriction might lead to a shortage of necessary personnel and that it would be difficult to replace workers who came to Fukushima from a distance. As an alternative, TEPCO and the primary contractors introduced a program in which all new workers were asked to disclose their own health conditions via self-administered questionnaires on October 24, 2011. A physician confirmed their condition face to face only if there were any issues with their health in the questionnaires. However, the number of cases that were deemed to require an interview with a physician and in which treatment of hypertension was deemed necessary to work without any restrictions were far smaller than the authors had expected from professional experience, indicating that a self-reporting-based program did not have sufficient power.

Then, receiving a “work permitted” judgment by a doctor on the basis of the results of the latest general health examination and specific health examination for ionizing radiation became a condition for receiving an issuance certificate for worker registration on June 11, 2012. Specifically, primary contractors must describe the work content in a job information provision form, have the worker concerned bring it to the physician at the time of their health examination, obtain a “work permitted” judgment notice, and submit it to TEPCO. The physician was as-

sumed to be an occupational physician if the company was large enough to appoint one. Meanwhile, TEPCO provided a service whereby workers for contractors that did not appoint an occupational physician could receive a “work permitted” judgment at a clinic in the nearby J Village (a soccer-training facility used as a support base). This service was terminated in October 2012 when it was decided that each primary contractor had established the necessary systems for subcontractors.

2) Development of “Guidelines on Fitness-for-Duty Evaluation and Work Restrictions Based on the Results of Health Examination”

Through the discussion at the hygiene representatives’ meeting, it became evident that some of the company representatives had concerns such as that the criteria for judging workers “fit for duty” were too vague to prevent incidents. Therefore, the authors, with the name of the UOEH, developed the “Guidelines on Fitness-for-Duty Evaluation and Work Restrictions Based on the Results of Health Examination” by studying the best practices that had been implemented by one of the primary contractors. The guidelines indicated the judgment criteria using a matrix between eight listed task types and 14 highly specific health conditions. The task types were work in a high place, work near an opening, work in a confined space such as a tank, heavy weight handling work, work such as assembly and disassembly of scaffolding, work with a respirator, night-shift work, work in high temperature and high humidity, operation of construction machinery or heavy machinery etc., and other dangerous or harmful work. The specific health conditions were high blood pressure with poor control, diabetes with poor control, severe anemia, severe obesity, cardiovascular disease, cerebrovascular disease, liver dysfunction, renal dysfunction, lung dysfunction, vision or visual field disturbance, mental illness, epilepsy, dizziness, and low back pain.

The Radiation Emergency Medicine Network Meeting is a meeting in which all of the representatives from the medical organizations involved in a nuclear accident discuss the medical and health issues of the NPP workers on the basis of the Basic National Response for Nuclear Emergency Preparedness Measures⁸⁾. The guidelines were endorsed by the meeting held on February 8, 2015, and the proceedings were provided to primary contractors through TEPCO. We advised the contractors to ask doctors to refer to the guidelines when assessing fitness for duty. At the same time, it was decided to continuously monitor some indicators for the effect of the fitness-for-duty management program, such as the number of deaths on site due to diseases and the number of cases that needed transportation to external medical institutions.

3) Clarification of Achievement Targets for All Workers and Confirmation of the Status of Efforts

In late 2012, an enhancement of the program at the time of worker registration was considered to cover peri-

odic health examinations for those who work for a certain period of time. Basically, these efforts were within the range of regulatory requirements already applicable to all employers, but it was thought that implementation might be difficult for smaller companies. Therefore, the authors, as members of the occupational health experts' meeting, continually suggested that health care for subcontractors' workers should be the responsibility of their primary contractors. However, there were some issues such as primary contractors being burdened with responsibilities that exceeded their legal obligations and the health information of workers being handled by entities that did not have a direct employment relation with those workers. It was decided that the introduction of such a program would have been difficult at that time.

From August to September 2015, there were three cases of cardiopulmonary arrest followed by death and a fatal work accident inside the NPP. These were not necessarily cases that could have been prevented by ordinary occupational health activities, as confirmed by TEPCO's chief occupational physician. However, on August 26, 2015, the MHLW issued "Guidelines on Safety and Health Management Measures for the Accident of TEPCO Fukushima Daiichi Nuclear Power Plant," which focused on safety and health countermeasures for decommissioning work in the NPP⁹⁾. The guidelines were noteworthy in that they focused on personal health care for workers by the employers and requested that TEPCO and the primary contractors guide subcontractors more actively to take care of their workers appropriately. Furthermore, the MHLW Fukushima Labor Bureau also issued a guidance document to TEPCO on safety and health, including the enhancement of health care. TEPCO responded that they would examine and implement countermeasures after receiving guidance from the UOEH.

The occupational health experts' meeting clarified five conditions to be achieved for fitness for duty, with the support of the UOEH, in February 2016. They were (1) confirmation that all workers underwent health examinations regularly; (2) confirmation that all workers who required treatment or further examination as recommended by a health examination visited a medical institution; (3) confirmation that all workers who needed treatment continued to receive the necessary treatment at least while working at the NPP; (4) on the basis of the results of periodic health examinations, work restrictions or accommodations of the condition would be undertaken as needed; and (5) the content of the work restrictions or accommodations undertaken would be periodically reviewed and revised.

In consideration of how to achieve the five conditions, TEPCO conducted a survey of primary contractors with questionnaires and interviews from February to March 2016. The responses confirmed that periodic health examinations were carried out by all subcontractors, but

only 60% of the primary contractors confirmed that all workers of their own and subcontractors who required treatment or further examination as recommended by a health examination visited a medical institution and that all workers who were recommended treatment in their visit to a medical institution continued with that necessary treatment. Most companies did not meet the other conditions. Therefore, in April 2016, TEPCO asked primary contractors to implement a program for achieving the five conditions and to start the operation of the program in July. TEPCO confirmed that all the primary contractors had implemented the program successfully as of the end of November 2016. A large variation was observed in the proportion of those who needed medical treatment or further examination per total health examinations and other indices both in directly employed workers and in those of subcontractors. The reasons in the differences should be investigated to improve the quality of the efforts.

The MHLW opened a health consultation desk for all workers working at the NPP on July 8, 2016. The consultation desk was open once a week, initially at the J Village or the NPP and then only at the NPP. Thereafter, the services of the consultation desk were improved to support the programs for managing fitness for duty operated by TEPCO and the primary contractors. Indeed, some representatives of primary contractors brought the health examination data of workers with medical issues and received advice on how to take care of them. If the consultation desk is effectively used, it is expected that the quality of the programs for managing fitness for duty will be improved.

Discussion

The International Atomic Energy Agency has issued standards for safety commissioning and the operation of nuclear power plants, and one of the requirements in the standards is that the operating organization shall be staffed with competent managers and sufficient qualified personnel for the safe operation of the plant¹⁰⁾. The standards require the operating organization to institute a staff health policy and to ensure the personnel's fitness for duty. In this regard, the United States Nuclear Regulatory Commission requires certain nuclear facilities to have fitness-for-duty programs mainly on avoiding substance abuse and managing fatigue¹¹⁾. Meanwhile in Japan, there are no specific requirements other than health examinations that are prescribed by laws and regulations. Employers are required to provide a general health medical examination to all workers periodically as well as a health examination for ionizing radiation. This is to hear the opinions of doctors on workers' fitness for duty and to take necessary measures according to the Occupational Safety and Health Act, article 66-4 and 66-5. Therefore, the efforts on fitness for duty made at the NPP are essen-

tial measures to be carried out at all working sites, and we merely tried to introduce a program to conform the implementation status beyond legal responsibilities.

There were several difficulties in introducing the fitness-for-duty program for each employer at the NPP. There is a business structure in which TEPCO orders tasks from primary contractors who then perform those tasks by farming them out to many subcontractors, most of which are small enterprises. Even in the usual situation, the implementation rate of the legally required fitness-for-duty program is low at small-sized workplaces¹²⁾, and it has been difficult for them to secure occupational physicians from the area around the NPP after the disaster. When considering the special conditions, such as the presence of a large number of temporary workers, a stressful work environment, and a lack of emergency hospitals nearby, the Fukushima Daiichi NPP in particular is a workplace in which the need to strictly manage workers' fitness for duty through a reliable program is crucial. Therefore, it is necessary for TEPCO as the operator of the NPP and primary contractors to respond beyond its legal requirements and for the government to provide direct support.

In this case, there were various concerns about the enhancement of fitness-for-duty management programs having possible adverse effects on the work at the NPP, such as shortages of necessary personnel caused by work restrictions, the burden of new registration procedures, a difficulty in replacing workers who came to Fukushima from a distance, and resistance to accepting responsibility beyond legal requirements. For these reasons, the programs were developed step by step under the guidance of the government, whose involvement was triggered by the occurrence of on-site death cases and other health problems. In other words, if no significant case had been reported, the response of the government would have been insufficient, and efforts would not have progressed without guidance from the government. Furthermore, even with significant improvement of the programs, quality issues in assessing workers' fitness for duty still exist, since the number of occupational physicians who understand the special nature of the work and the environment in the NPP and who can appropriately evaluate those workers' fitness for duty is limited.

Despite these difficulties, against this background and the fact that it took more than 5 years to establish the programs to manage fitness for duty, these experiences should be useful in preparation for similar crisis events in the future. Stakeholders and decision makers should understand that workers and volunteers with various types of employment arrangements work under a complex organizational structure when a major disaster occurs, and stringent management of a fitness-for-duty program is necessary because of the existence of a lot of workers whose health status is unknown, a stressful work environ-

ment, and the collapse of an emergency medical system. They should also understand that the parties concerned, i.e., companies in high positions in the hierarchy in this case, hesitate to assume responsibilities beyond their legal requirements, even in a crisis situation. The number of risks when responding to large-scale disasters is extremely high; thus, it is necessary to prepare a framework that allows the government or other administrative agencies to actively provide guidance to the concerned parties from early on, especially so that companies in high positions in the hierarchy take responsibility in quickly introducing fitness-for-duty management programs for workers at disaster sites and so that occupational health specialists are able to contribute.

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