

What Kind of Doctors are Required in Areas where Nuclear Power Plants are Situated? – Training General Practitioners who Can Provide Radiation Emergency Medicine –

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Nuclear disasters had been considered extremely rare, but the Fukushima Daiichi nuclear crisis that accompanied the Great East Japan Earthquake caused people's awareness to change considerably. Many regions with nuclear related facilities, such as Fukui Prefecture, have a chronic shortage of doctors, and therefore do not have the means to employ radiation emergency medicine specialists. General practitioners that can provide comprehensive medical care including emergency and radiation emergency medical care are appropriate in such regions. Fukui University began to train general practitioners skilled in emergency medicine and familiar with radiation emergency medical care from 2009. It is both the role and responsibility of teaching hospitals to coordinate with local governments and train doctors suited to support hospitals in these regions.

Key words: Emergency radiation medicine, emergency medicine, comprehensive medical care, Fukushima Daiichi nuclear power plant, nuclear disaster

1. Introduction

The Fukushima Daiichi nuclear crisis that accompanied the Great East Japan Earthquake of March 13, 2011 has increased public unease regarding nuclear disasters. Many regions with nuclear power plants have the same problems. Furthermore, weakened regional health care in

such regions caused by a chronic doctor shortage is also becoming an issue. Besides the comprehensive medical care capability of rural physicians, such regions require human resources that can provide emergency radiation medical care.

Approximately 30% of Japan's nuclear related facilities are located in areas surrounding Tsuruga City, in southern Fukui Prefecture. Fukui University has been coordinating with Tsuruga City since 2009. The city, which required reinforcement of its radiation emergency medicine system, began an initiative to train general practitioners skilled in emergency medicine and familiar with radiation emergency medical care.

It is our objective that those who complete our program

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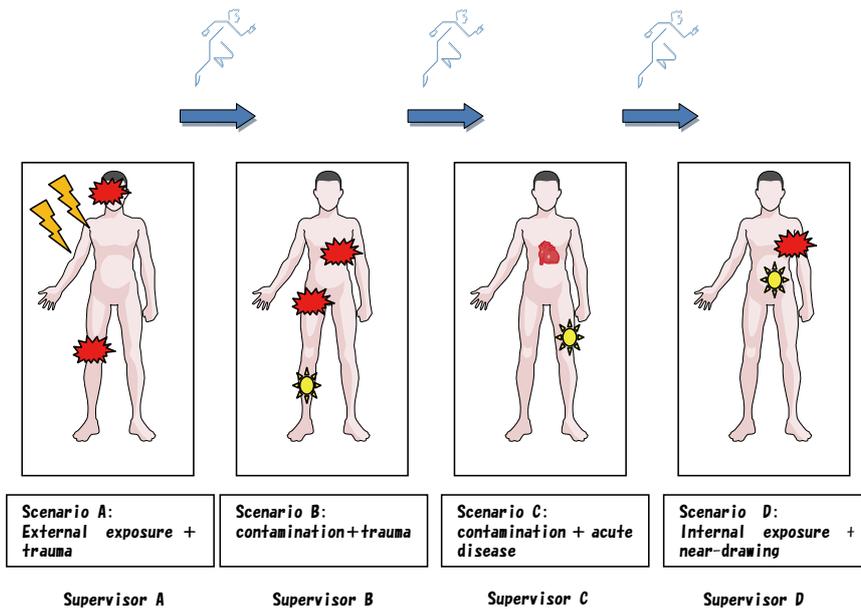


Fig. 1. Simulation training.

reinforce the Tsuruga region emergency medical care as general practitioners skilled in emergency medicine. It is also our objective that they become leaders in radiation emergency medicine not only in Tsuruga City but throughout Fukui Prefecture, and contribute to education in other prefecture.

2. Methods

The program is composed of two levels, “a radiation emergency medicine provider training course (3 years)” and “an instructor training course (5 years)”. The radiation emergency medicine curriculum was added to “the emergency and comprehensive medical care education curriculum” already being conducted at the University of Fukui Hospital since 2003. Training facilities are the University of Fukui Hospital, the Municipal Tsuruga Hospital which is located near nuclear power plants, and nuclear-related facilities in the region.

After taking this course, trainees acquire the ability to provide basic radiation emergency medicine in addition to clinical skills as emergency physicians and general practitioners. The following points are prioritized when studying radiation emergency medicine.

2.1. Study of basic radiology knowledge

Acquire basic knowledge regarding radiology and learn how to communicate adequately with radiation health care professionals. Learn how to handle basic measuring equipment such as survey meters and how to diagnose the presence, absence and extent of contamination or radiation exposure and provide appropriate care.

2.2. Training using simulation methods



Fig. 2. Scene of the practical exercise.

In order to train students to appropriately manage radiation emergencies, which are rare, we conducted educational simulations involving various scenarios. These simulations included a case in which radioactive contamination affected a lower limb open fracture, a near-drowning case in which the patient fell into a water tank and sustained internal radiation exposure and a case of external radiation exposure complicated by myocardial infarction (Fig. 1 and 2).

2.3. Acquiring educational skills for activities to raise awareness in other occupations and in local residents

Terminology that nonexperts would find difficult to understand is used in radiation emergency medicine. Therefore, it is important to impart educational skills that enable trainees to explain things simply using plain vocabulary and be sufficiently understood.

3. Results

This course began in 2009, and 12 trainees are currently engaged. Although no trainees have completed the entire course, some have already achieved successes in the fields of radiation emergency medicine and regional health care.

4. Contribution to Countermeasure the Fukushima Daiichi Nuclear Power Plant Accident

Immediately after the Fukushima Daiichi Nuclear Power Plant crisis became apparent, two trainees from this course went to the Fukushima Prefectural Government Office accompanied by attending physicians on March 13, 2011. They considered many inquiries, including those regarding methods for handling radioactive contamination. They also participated in creating a radiation emergency countermeasure headquarters with Hiroshima University, Nagasaki University or specialist facilities such as the National Institute of Radiological Sciences (NIRS). Medical teams followed two basic principles when conducting activities: 1) the survey of local residents and provision of accurate information to allay public anxiety, 2) the provision of primary care and transport for cases of high-dose radiation exposure or contamination.

On March 14, 11 workers were injured in the hydrogen explosion at nuclear power plant reactor unit 3. Trainees of this course transported an injured person one of the victims who had sustained a laceration on their left femur, using the Self Defense Force aircraft to the NIRS hospital, while providing initial treatment. They also conducted a survey of residents regarding the presence of contamination caused by radioactive materials.

5. Contribution to Regional Health Care in Tsuruga City

Two of our trainees started up new emergency rooms in 2011 at the Municipal Tsuruga Hospital in southern Fukui Prefecture where nuclear power facilities are located. They began working as emergency physicians and are contributing to regional health care. Other than their clinic duties, they are also conducting many educational activities for hospital personnel and the general population regarding radiation emergency medicine (Table 1).

6. Discussion

The giant tsunami brought about by the Great East Japan Earthquake caused significant damage to the Fukushima Daiichi Nuclear Power Plant. As a result, large amounts of radioactive materials diffused into surrounding areas, forcing many residents to evacuate. Nuclear disasters had been considered extremely rare up until this point, and this accident caused people's awareness to considerably change.

Nuclear disasters are said to have a number of characteristics. Radiation and radioactive plumes are not visible to the naked eye. For this reason, misunderstandings and confusion can

Table 1. Number of activities to raise awareness regarding radiation emergency medicine conducted by our students

Content	2009	2010	2011.-2011.9
Workshop (hospital personnel)	0	2	6
Workshop (general residents)	0	0	9
Academic conference presentation	0	0	4
Newspapers and Television	4	5	16

Table 2. The following CESIUM is crucial when a radiation emergency occurs

- Classify the risk, Safe or Not ?
- Early response
- Stop the panic!
- Inform correctly
- Understand what is going on
- Medical treatment

easily occur in areas surrounding nuclear power plants, which can sometimes lead to panic. The possibility of developing late-onset physical disorders, despite nothing being obvious in the initial period of radiation exposure, creates more anxiety (Table 2).

In addition to residents, many clinicians have little knowledge regarding radiation emergencies. As a result, they experience difficulties when they are faced with cases requiring knowledge of radiation emergency medicine. Meanwhile, although radiology experts have an abundance of experience and knowledge regarding radiation, they are often not skilled at treating external wounds or evaluating the general physical status of trauma patients. Such situations require physicians who can provide emergency care and radiation emergency medical treatment while consulting with experts. Such physicians are extremely rare. Nuclear Safety Research Center and NIRS have conducted short courses of learning how to treat emergency cases of radiation accidents for the people of various occupations. Recently, Hirosaki University of Aomori prefecture where many nuclear power plants are located began the education program for professionals in radiation emergency medicine. They try to educate not only physicians but paramedics.

Japan's radiation emergency medicine system was reorganized after the critical accident that occurred in 1999 at the Tokai-mura uranium fabrication facility. Hospitals involved in radiation emergency medicine were divided into primary, secondary, and tertiary institutions. Primary institutions are situated near nuclear-related facilities and perform a survey and decontamination of the victims and outpatient care for mildly affected patients. Patients who require inpatient care are transported to secondary institutions within the prefecture immediately after being given initial treatment. Patients with high-dose radiation exposure or internal radiation exposure require more specialized approach. They are transported to one of

two tertiary institutions which are Hiroshima University Hospital and NIRS. Throughout the process of constructing this system, a number of radiation exposure medical care specialized facilities such as NIRS, Nuclear Safety Research Association, Hiroshima University, and Nagasaki University assumed important roles. Routine coordination between facilities is necessary, because radiation emergencies are rare. In particular, coordination between primary and secondary institutions in the area is important to effectively deal with a radiation emergency.

University of Fukui Hospital, a secondary institution, has been receiving funding for the development of the human resources who can contribute to regional health care from the Japan Science and Technology Agency since 2009. Fukui University is working in coordination with local governments to form a program for training physicians who can provide emergency medical care, comprehensive medical care, and radiation medical care. The ideal physician is a doctor skilled at radiation emergency medicine who can contribute to regional health care during times of peace as an emergency and general practitioner. Such physicians are necessary in regions with nuclear-related facilities to instill a sense of security in residents regarding medical care and safety.

7. Conclusion

Many regions with nuclear related facilities, such as southern Fukui Prefecture, have a chronic shortage of doctors, and therefore do not have the means to employ radiation emergency medicine specialists. General practitioners that can provide comprehensive medical care including emergency medical care and radiation emergency medical care are appropriate in such regions. It is both the role and responsibility of teaching hospitals to coordinate with local governments and train doctors suited to support hospitals in these regions.

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