

The Current Situation and Future Scope of Radiation Emergency Medical Care Network in Nagasaki

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Under the framework of the International Consortium for Medical Care of Hibakusha and Radiation Life Science (Nagasaki University 21st Century COE Program) and bearing in mind the unique history and responsibility of Nagasaki University, several projects on radiation emergency preparedness are in progress. The critical accident in Tokaimura, Japan in 1999 made us realize that nuclear emergencies happen anywhere radionuclides exist. In fact, nuclear accidents possibly take place in factories, research facilities, hospital and wherever radioactive materials are in transit. Therefore, it is necessary to establish an effective preparedness network system for potential radiation emergency that may occur in Nagasaki and nearby prefectures and to cooperate with other Japanese and worldwide networks.

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Introduction

Nagasaki University has been the only medical school in the world exposed to an atomic bomb. A number of citizens, including many medical students and staff were killed or injured, resulting in acute or late radiation effects. They received medical treatment, and their medical records were collectively investigated by survived doctors of Nagasaki Medical School Hospital, which has been followed by Radiation Effects Research Foundation and Nagasaki University thereafter. Therefore, Nagasaki University has an enormous amount of knowledge of Hibakusha, namely radiation-exposed victims, and radiation disease and needless to say, has the responsibility to make contributions to the current world through the experience gathered in this dramatic and tragic legacy.

The nuclear power plant accident in Chernobyl, Ukraine in 1986 brought vast damages both to the people and the environment around the site. Most people in Japan, however, would be less aware that we have also experienced serious radiation accidents in Japan. For example, an unexpected critical reaction occurred in Tokai-mura, Ibaragi prefecture, in 1999 killed two, out of three, victims due to acute radiation exposure. Furthermore other accidents at atomic power plants were reported almost every year, though fortunately these were nei-

ther large-scale nor radio-contaminated accidents. These facts let us realize that radiation emergency could happen anywhere.

The purpose of the radiation emergency medical project of the International Consortium for Medical Care of Hibakusha and Radiation Life Science (Nagasaki University 21st Century COE Program) is to play a role in the network system of the WHO Radiation Emergency Medical Preparedness and Assistance Network (REMPAN) as well as to contribute to the Japanese radiation emergency network. The specific aims of this project are: 1) To provide a medical suggestions and send specialists of radiation emergency medicine to the main office of local radiation accident sites. 2) To accept and treat the patients suffering from radio-contaminated accidents. 3) Exchange of information and talented researchers on emergency radiation medicine, as well as research cooperation, under the international network. 4) Provision of a system for radiation emergency care and training course on radiation accidents. 5) To promote technology and research on emergency radiation medicine and also to contribute to public education. 6) To play an important role in emergency radiation medicine in collaboration with WHO-REMPAN and national programs.

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Steps in the progress of radiation emergency medical care network in Nagasaki

Lectures

Several lectures of radiation emergency medicine were held at Nagasaki University from December 2002 in cooperation with the Japanese Nuclear Safety Research Association (NSRA). The NSRA foundation was established in 1964 by the Japanese prime minister and Minister of International Trade and Industry to perform collaborative research on nuclear safety, with academic experts and researchers who can respond to requests made by the Japanese government or non-governmental facilities. The first lecture, Nagasaki Forum, held in 2002 with approximately 50 participants including medical doctors, researchers, radiation protection supervisors and medical students, covered the history of radiation accidents and actual medical care in radiation accidents/disasters. In 2003, we had the 2nd Nagasaki Forum that contained a wider variety of lectures such as the basic knowledge of radiation (nature, unit and biological effect), acute radiation syndrome, establishment of emergency radiation medical system in Japan and dose estimation. A video instruction for medical staff on how to treat radiation victims was also provided.

WHO REMPAN also gave us intensive lectures at Nagasaki University for 3 days in August 2003, and more than 20 staff, mainly belong to Atomic Bomb Disease Institute, were attended. The original presentation files used in these lectures were then edited and released as a Japanese version of IAEA/WHO training course CD-ROM (Figure 1). This is an excellent educational tool for radiation emergency preparedness, covering comprehensive knowledge of radiation from the basics to the practical issues with plenty of pictures.



Figure 1. Japanese version of IAEA/WHO training course CD-ROM.

Practical training

Practical trainings were also conducted by NSRA at Nagasaki University Hospital in 2003 and 2004, with 38 and 27 participants each year, including medical staff, emergency and rescue team and office staff. In these sessions, medical team members prepared us with disposable gowns, masks and gloves to prevent radio-contamination. The received radiation dose during the session was monitored by personal dosimeter (Figure 2). We used a mock patient, and learned how to manage a patient who was exposed to radiation and is still contaminated with some amount of radioactive materials. The team consisted of two doctors, three nurses and two radiological technicians. Other staff such as office staff or radiation specialists should be present depending on the situation. Another lecture was also held for demonstration of a whole body counter at our medical school to estimate the internal radioactivity.



Figure 2. A scene from the practical training for radiation emergency.

Websites

We can examine various information including the history, examples and management of radiation accidents by accessing websites. As one of those useful websites in Japanese, the Radiation Emergency Medicine Information Network (REMNET), is provided by NSRA (<http://www.remnet.jp/>). Other informative websites include Radiation Emergency Assistance Center/Training Site (REACT/S) by Oak Ridge Institute, U.S. (<http://www.ornl.gov/reacts/>), and WHO-REMPAN are also useful (http://www.who.int/ionizing_radiation/a_e/rempan/en/).

Predictable accidents

What kind of potential radiation emergency accidents we might have now? Even though the possibility is deemed quite low, risk of radiation accident still exists at nuclear power plants, industrial and

Table 1. Envisioned accident places in Kyushu

Nuclear power plant	Genkai (Saga), Sendai (Kagoshima)
Industrial or research facilities and hospitals	
Atomic submarine base	Sasebo (Nagasaki)
Radionuclide in transit	any place on the road
Other	any place in the case of terrorist attack

research facilities, hospitals, atomic submarine bases, radioactive materials in transit and everywhere in case of terrorist attack using dirty bomb (Table 1).

Nuclear power plants

There are many, actually over 50, nuclear power plants in Japan. The risk of critical explosion, such that in Chernobyl, are supposed to be very low in Japanese power plants because of the differences in structure and safety systems. Therefore, most accidents are likely to happen in a smaller scale. For example, workers in radiation-controlled areas of a plant might have injury or burns with contamination of radioactive material. An accident in Mihama power plant, Fukui prefecture, in August 2004, did not involve radio-contamination, but eleven workers responsible for system checking were injured by hot steam spewed from broken pipes and four of them died.

Industrial or research facilities and hospitals

In hospitals, we use X-ray for the patient's examination and also irradiate patients with ionising radiation for their treatment on a daily basis. In this situation, there are possibilities of 'over-exposure' due to incorrect dose calculation or inappropriate quality assurance. In research facilities, we often use radionuclides for our experiments. During the handling of radioactive materials, both internal and external exposure to low dose radiation would occur accidentally.

Atomic submarine base

Regarding atomic submarines, it is very difficult to predict what will happen or not in the future because the detailed information on radiation safety management of atomic submarines are not disclosed. However, considering the fact that the U.S. atomic submarines with nuclear energy have been frequently visiting Japanese ports, the possibility of a radiation accident should not be excluded.

Radionuclides in transit

Radionuclides for use in hospital, industry or research facilities are usually transported by transportation vehicles. If a traffic accident happens on the way to the destination, radioactive materials have possibility to spill over the road resulting in contamination of people and the environment.

Terrorism

Unfortunately, the risk of terrorism cannot be ruled out such as dirty bombs in unexpected places leading to the public exposure.

The Hibakusha Medical Center and the Team of radiation emergency medical care in Nagasaki

As a part of Nagasaki University 21st Century COE Program, Hibakusha Center was established in Nagasaki University Hospital in April 2003. This center is taking care of Hibakusha patients not only in Nagasaki but also foreign countries such as Korea, Brazil and the U.S.

Another important role of our department is to participate in and create a radiation emergency medical care network system in Nagasaki. For example, there are two power plants, Genkai, Saga prefecture and Sendai, Kagoshima prefecture in Kyusyu, and if an accident occurs in these power plants and patients receive severe injury, Nagasaki University Hospital is ready to admit them. With such a possibility in mind, we are preparing to manage such patients in collaboration with various departments in the hospital and medical school including the Nagai Takashi Memorial International Hibakusha Medical Center (Hibakusha Medical Center), Emergency Unit, Plastic Surgery (Dermatology), Haematology, Radioisotope Center and the Atomic Bomb Disease Institute.

To accomplish this effectively, we have to develop and keep the ability to management radiation-exposed patients through regular lectures and practical training with communications among medical staff of different departments. Ultimately, we need a team to cooperate with and create the manual of radiation emergency medical care in Nagasaki to help succeed the project safely and properly (Figure 3).

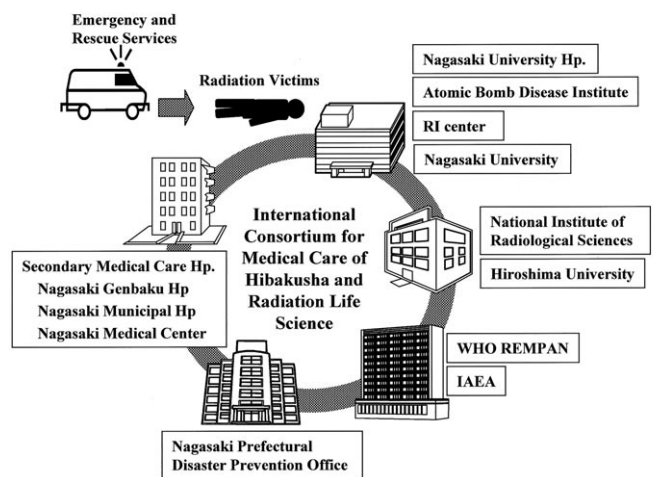


Figure 3. Whole Image of Radiation Emergency Medical Care Network in Nagasaki.

Discussion

We described the current status of the radiation emergency preparedness in Nagasaki and reviewed predictable radiation emergency accident scenarios. As a part of the preparedness, we have made out a flowchart for radiation victim management at Nagasaki University Hospital. Obviously as accidents are very difficult to predict, we need to elaborate and maintain a proper level of preparedness for the emergency to provide all the victims with an appropriate medical care. At the present stage, we are developing the Nagasaki Radiation Emergency Medical Care Network that will handle possible accident(s) in Nagasaki and its neighbour prefectures in Kyusyu. A particular aspect of radiation accidents is 'very low incidence but potentially high severity.' Therefore, it is very important to establish

in the near future a cooperative system that would include not only Nagasaki University but also other collaborative hospitals and public administrations in Nagasaki. Furthermore, other tertiary medical care centers in Japan and neighbour countries such as Korea, Taiwan, Vietnam and China should be involved in this cooperative system. We believe that the overall network greatly helps swift and effective responses to radiation emergency in Japan and Asia.

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