Nikkei Medical 8/2011 “Portrait of a Hero”

Practicing World-Class Family Medicine in Fukushima

Struggling to Recover from the Great Disaster

Ryuki Kassai*
Professor and Chair, Department of Community and Family Medicine, Fukushima Medical University

The type of physician that Dr. Ryuki Kassai wanted to become was a family doctor. He learned family medicine while studying abroad in Canada and practiced it in Hokkaido, and later in Fukushima. After the disaster, he visited the evacuation zone 30 km around the nuclear power plant, providing support that was rooted in the community.

Studying in Canada in His Thirties under Dr. Ian McWhinney, the “Father of Family Medicine.”

Ever since I set my sights on medical school, I knew I wanted to become a family doctor because I felt that it was prototypical. Thus, for two years starting in 1990, I studied at the University of British Columbia in Canada and underwent training as a resident in family medicine.

During my training, I was able to freely choose some electives. Impressed by the concept and practice of “patient-centered medicine” discussed in *A Textbook of Family Medicine*, I definitely wanted to study with Dr. Ian McWhinney, the book’s author, and creator of the University of Western Ontario’s family medicine program. Therefore, I asked my academic advisor to write him a letter.

A little while later, I received a reply from Dr. McWhinney, simply saying, “Come here, I’ll be waiting.” So, I left immediately. I remember that my plane was delayed and landed in the middle of the night, but Dr. McWhinney was waiting for me at the bus terminal, and he drove me to his home.

For the following month, we would spend two or three hours together every day, Monday through Friday, reading and discussing his book. On the weekends, we would continue the discussion at his home over meals cooked by his wife.

Initially, we had planned these personal lessons for only the first two weeks. However, while I was there, Dr. McWhinney’s father-in-law passed away. He had to cancel his business trip to Taiwan, and I could study this way for a full month. There are scholars and pupils all over the world, but surely no other pupil before or after me has been able to learn so intensely.

Dr. McWhinney suggested that I should create a system to support family medicine in Japan if we did not have any, so I returned to Japan in 1992, confident that this was exactly what I should do.

With a Growing Desire to Enter into the Community to Practice and Teach Medicine, Dr. Kassai Helped Establish the Hokkaido Center for Family Medicine in 1996.

On returning to Japan, I enrolled in the Department of General Medicine at Kawasaki Medical School, but I could not actively participate in the community while at a university hospital. While I was hoping to join the community and practice family medicine, I was invited by Akio Nishimura, then Director of the Caress Alliance Medical Corporation that ran the Nikko Memorial Hospital in Muroran, Hokkaido. Thus, 15 years ago, we created the Hokkaido Center for Family Medicine under the same corporation.

*Ryuki Kassai was born in Niigata Prefecture in 1957. He graduated from Hokkaido University in 1984 and later studied pediatrics at the same university. In 1990, he became a resident in family medicine at the University of British Columbia in Canada. In 1996, he became the director of the Caress Alliance’s Hokkaido Center for Family Medicine. In 2006, he became a Professor of Community and Family Medicine at Fukushima Medical University and has served in his current position since 2010.

Residency at the University of Western Ontario, Canada. On the far left is Dr. Ian McWhinney, Professor of Family Medicine. Dr. Kassai is second from the right.

The Hokkaido Center for Family Medicine 15th Anniversary Alumni Meeting was held this past July. Dr. Kassai is in the middle of the front row. To his right is Dr. Thomas Freeman, Professor of Family Medicine at the University of Western Ontario.

I had been trained in family medicine while in Canada, but I had no experience creating training programs. Therefore, at first, it was a bit of trial and error. Thankfully, however, my colleagues from around the world showed me their curricula and encouraged me, and their support truly helped. Therefore, I recommend young students who come to train that they go out and observe the practice of family medicine in other countries. I want them to see firsthand what exactly world-class family medicine is.

When I transferred to Fukushima Medical University in 2006, President Shin-ichi Kikuchi understood my desire to train the next generation of physicians that would graduate from the university hospital and practice in the community. We have bases all over the prefecture, from which senior residents can practice, with residence facilities as well.

The family doctor that I wanted to be is the type that understands and can implement Dr. McWhinney’s “patient-centered medicine” methods not just at the level of listening to what the patient says—it is more than that and requires specialized training.

Listening to the patient, examining the patient, ordering tests, diagnosing conditions, prescribing medicine.... For all of this, we must understand and master evidence-based medicine (EBM). However, to understand the patient’s pain and where he or she is coming from, we must also practice narrative-based medicine (NBM). It is important to not just think about the patient but also his or her family and entire community. We must adeptly change our examinations, role, and functions to meet the needs of the individual, family, and community. That is what a family doctor should do.

Fifteen years have passed since I began to train family doctors in Hokkaido, and five years have passed since I began working in Fukushima. I think that all those who studied with me and are since practicing as family doctors are able to implement the methods of patient-centered medicine. Family doctors, who come to Japan from all over the world, are impressed by the vision and practice levels of those doctors who have studied with me. I am very pleased about this.

With the Great East Japan Earthquake, Fukushima Prefecture Fell Victim to an Earthquake, a Tsunami, and a Nuclear Accident. The Prefecture is Still Busy with Reconstruction Efforts.

Emergency medicine is clearly necessary in times of disaster. However, few people overall need high-level medical care, and most only need primary care. But with the Great East Japan Earthquake, many of the primary care practitioners in the area around the nuclear power plant left their communities. Thus, everybody in need of medical care crowded tertiary medical facilities, causing confusion and exhausting medical staff at the hospitals.

I was requested by the prefecture and university’s Disaster Response Headquarters to assume the task of finding non-ambulatory people within the zone 20–30 km from the nuclear power plant. Teaming up with the Self-Defense Forces, government officials, fire fighters, and community nurses, we travelled around in a Self-Defense Force vehicle. Starting on April 4, we went around the entire half-donut shaped area we were assigned in one month, searching for those needing medical or nursing care. Because we did not know the health conditions of all community residents, we relied on information from long-term care insurance and national health insurance records or neighbors telling us things such as “there is an elderly lady with dementia in

the area."

In the end, the actual number of people requiring hospitalization was four. One of these was at risk of septicemia from severe bed sores. Another was a carrier of miliary tuberculosis. The last two were in poor nutritional states, but were good enough that under the right conditions, even a family doctor could treat them. For the people we deemed as not requiring hospitalization but still needing continued care, we provided continued visits from the next week onward.

The things that must be done change with time. Thus, our role as family doctors changed in response to new needs, such as the health management of residents who moved to different places after the closing of evacuation centers, and the mental health care of students returning for the new semester from Tokyo and other areas. We made short-, mid-, and long-term plans about what medical care community members needed, seeking the opinions of community nurses and government officials. I am truly glad to have learned the methodologies of family medicine.

As part of the reconstruction efforts, I would like to continue to help foster the wellness and fitness of community members to avoid diseases. All of last week, we held relaxation gymnastics classes throughout the prefecture. Relaxation gymnastics is a type of exercise for relaxing the body by massaging the calves and back of the neck and rubbing the whole body. Kabuki actor and certified instructor Kikunosuke Onoe visited evacuation centers and hospitals and led relaxation gymnastics classes for us. In addition, to cheer up the children, we are now planning with the Australia–Japan Society an exchange event between children from Fukushima and those of the same age from Australia.

(as told to Kyoko Kitazawa)

BMJ Group blogs [http://blogs.bmj.com/]

The First Seven Days of the Disaster

Ryuki Kassai
Professor and Chair
Department of Community and Family Medicine
Fukushima Medical University
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First of all, I want to express my deep sympathy for those who lost their loved ones, their houses, their work, their home towns, and their hope by this terrible disaster.

Who, in later times, will be able to understand that we had to fall again into the darkness after we had once known the light?

Sebastien Castilian: De arte dubitandi (1562)
Quoted in Kenzaburo Oe: Hiroshima Note (1965)

It is now seven days since the first earthquake and tsunami hit us in the Pacific Coast areas of the Tohoku region (the northernmost region of the main island of Japan made up of the 6 prefectures – Aomori, Iwate, Akita, Miyagi, Yamagata, and Fukushima). The disaster that we now call the "Tohoku-Kanto Earthquake" was caused by the strongest earthquake ever recorded in Japan (magnitude 9.0) followed by a 15 metre tsunami and hundreds of aftershocks which are still hitting us every day and night. According to a National Police Agency tally as of at 7 pm on Friday, March 18, at least 6,911 people were killed and 10,316 were missing. In Fukushima Prefecture where I am (the southernmost prefecture of the Tohoku region; population 2,026,826, area 13,782.75 km^2), at least 602 people were killed, 3,844 are missing, and 45,826 people were compelled to live in 426 evacuation shelters in the prefecture. We still do not know the exact numbers of casualties, because the damage is too enormous.

The first 2 days were hectic. Essential services such as water, gas, electricity, and phone networks were not working. Normally I move between 5 teaching practices in the communities (20 to 230 km apart one another) to teach 17 GP registrars in the prefecture, but I had to cancel these visits because the transportation systems and the roads were badly damaged. I tried hard to make sure all my trainees and colleagues were safe and sound. However, I was not able to contact them all until five days after the first earthquake hit. Five of them had been working in Soma and Iwaki, some of the towns that had been directly affected by the tsunami. Fortunately, they are all safe and we have been able to talk to each other using our internet network. I have also been part of the anti disaster team at Fukushima Medical University (FMU) in Fukushima City. Major trauma patients and patients with medical and surgical emergencies were brought by helicopters to the FMU Hospital, the largest teaching hospital in the prefecture. The hospital itself has been functioning well, collaborating with the prefectural government headquarters and the Disaster Medical Assistance Teams (DMATs) who came from several other prefectures in Japan that had not been hit by the disaster, but it was difficult for us to get a picture of what was going on in the prefecture overall. A major lesson from this period was the need to resume information networks as quickly as possible after the disaster, collaborating with the local/national governments, police, paramedics, telecommunication companies, and the internet services.

In the following 2-3 days, hundreds of patients came to the FMU hospital, either by themselves or in chartered buses from community hospitals and nursing homes in the severely damaged tsunami hit areas. Our hospital was even busier, treating the emergency patients, and triaging the other patients who had a wide range of problems needing primary to secondary, even tertiary care. Many of the patients were frail, demented, bedridden elderly, often without a clinical

history and context. Some patients needed oxygen, IV fluid, tube feeding, or dialysis. Others were suffering from hypothermia, aspiration, or pneumonia. A major lesson from this second period was the need for a good collaboration between specialists in the hospitals and primary care physicians even in the acute disaster period. If many patients with primary care problems had not rushed into secondary/tertiary care hospitals after the disaster, the function of the hospitals would not have been affected so much. On the other hand, care of the weak (frail elderly, children, pregnant/nursing mothers, people with chronic illnesses, mental illnesses, or multiple co-morbidities) can easily fall behind in an acute disaster period without well functioning primary care providers.

Along with these "normal" disaster recovery activities, we had to face the third disaster after the earthquakes and tsunami, namely, the series of hazardous accidents at the nuclear power plants located on the Pacific Coast in Fukushima Prefecture. Even though the FMU hospital has well trained dedicated nuclear medicine specialists who had prepared for potential nuclear accidents and who could provide us with information, there was a high level of anxiety amongst the care teams, as well as patients and their families, that had increased like a cascade after rain.

Sometimes it became difficult to keep our strong Fukushima tradition of endurance (*gaman*) and non blaming culture. The mental well being of the caregivers who were under constant demanding pressure is an ongoing issue. A video clip on YouTube entitled Pray for Japan: be strong deeply moved us into tears. That was a good example how music and narrative can heal us. I wish people in the evacuation shelters could personally listen to their favourite music anytime they want without bothering others. Watching a TV repetitiously reporting the disaster news all through days and nights must be harmful for their mental well being.

I believe that the prevention of thyroid cancer of children should be a top priority. But we still do not have high quality standardised evidence based information to assist us. We experienced the disasters in Hiroshima and Nagasaki, but despite this there are many misunderstandings regarding radiation. We are now busy sourcing potassium iodide for the children in the Fukushima Prefecture and constructing systems to deliver the medicine and to provide parents with pertinent information on timing, duration, doses, and adverse effects of its administration. We need information on immediate, short, and long term effects of radiation, and interventions and strategies to alleviate the effects. Also, we want to know how better we can give that information to the parents, to support them emotionally, and to follow up beyond the acute disaster period. As we have many farmers and fishermen in Fukushima, we are very much concerned about risk of potentially contaminated foods (milk, meat, fish, vegetable, rice, buckwheat, sake, etc.).

I cannot predict what will happen next. I cannot estimate how long the recovery from the disaster will take us, either. *"After all, tomorrow is another day,"* might be true, but I want to humbly add to say that tomorrow is another day we could make a difference.

• Listen to Ryuki Kassai talk about the situation in Fukushima in a BMJ podcast

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The Second Seven Days of the Disaster

Ryuki Kassai
Professor and Chair
Department of Community and Family Medicine
Fukushima Medical University
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First of all, I want to express my sincere gratitude to those who provided us with useful information, who kindly donated to us, who warmly encouraged us, who thoughtfully conveyed our messages abroad, and who continue to pray for Japan after the disaster.

"(...) what he had been thinking about was the earthquake. Images of it had come to him one after another, as if in a slide show, flashing on the screen and fading away. Highways, flames, smoke, piles of rubble, cracks in streets. He couldn't break the chain of silent images."

Haruki Murakami: After the Quake (2001)
(Translated from the Japanese by Jay Robin)

In the second week of the disaster, we have had freezing weather in Fukushima and the Tohoku region as a whole, which has made our life even harder, especially without much fuel and petrol. The daily minimum temperature in Fukushima City has been below freezing point three days out of the seven. We normally begin to expect the cherry blossoms at this time of the year, but that is not the case this year. Ironically a view of the snowy white chain of mountains including Mt. Azuma (2,035 meters) and Mt. Adatara (1,700 meters) is very beautiful.

The number of casualties hasn't stopped rising. According to a National Police Agency tally, as of 9 pm on Friday, March 25, at least 10,102 (6,911 – the figures in the brackets are the ones reported one week before) people were killed and 17,053 (10,316) were missing. In Fukushima Prefecture, at least 855 (602) people were killed, 5,934 (3,844) are missing, and 61,998 (45,826) people have been forced to live in 356 (426) evacuation shelters in the prefecture. The full extent of loss of life is still unclear, as search efforts in Fukushima Prefecture have been hampered by the accidents at the Fukushima Daiichi nuclear power plant.

The acute disaster period has been followed by a period of uncertainty, especially in Fukushima Prefecture. Our largest concern for now is the unstable condition of the nuclear power plant. Despite several trial operations, bravely carried out by dedicated squads of the self defense forces, the fire and disaster management agency, and the riot police, to cool down the crippled reactors, they still seem active and uncontrollable with radioactive leakage. In the last day of the second week, three workers were exposed to radioactive water on the basement floor of the reactor's turbine building, two of whom were brought to the Fukushima Medical University (FMU) Hospital and then transferred to the National Institute of Radiological Sciences (NIRS) Hospital. It was reported that they had external contamination of their feet, not direct exposure. However, the implication of this accident was immense. A numbers of rumors about possible detonation spread by telephone, e-mail, TV, radio, the internet, etc. Many foreign officials, company employees, and international students were urged, through their diplomatic channels or by their families and friends, to get out of Japan immediately.

We need to understand that the information/knowledge gap about nuclear medicine, especially in terms of crisis management, is so big between specialists and lay people. Many health care workers are not aware of the distinctions in terminology about radioactivity e.g. the Becquerel(Bq), absorbed dose (the Gray, Gy), equivalent dose (the Sievert, Sv),

and effective dose; and the one between direct exposure to ionising radiation and contamination with radioactive materials. The media, politicians, and the public at large are also uncertain about what these terms mean. Sometimes they have confused these terms, including mistaking millisievert for microsievert, in national government announcements, and the media have confused these in news stories.

Moreover, the general public in Japan may not be good at explaining or thinking about risks relatively or in depth. At a press conference the government said, “We urge people not to drink milk, not to give tap water to infants, or not to eat vegetables such as spinach, broccoli, (…) in Fukushima and neighboring prefectures, because their radioactivity has exceeded the state's recommended safety standards." This was confusing and the Japanese people don't understand well what the risks really are, what they should or should not do, or for how long.

The academic and financial year starts in April in Japan, which is increasing the uncertainty. Most graduation ceremonies in March, including FMU's, were cancelled. FMU has decided to postpone our entrance ceremony in April by one month. We have heard that a few freshmen and registrars may decline their offers and not come to FMU or its hospital, because they and their families are so anxious about the uncertain conditions here in Fukushima. I understand them, but there is something very important for doctors of the future that can only be learnt under these circumstances. Luckily I expect all three new GP registrars and one trainer will come and join my department in April. The first lesson that they have to learn in Fukushima may well be “how to deal with uncertainty."

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Fukushima One Month On

Ryuki Kassai
Professor and Chair
Department of Community and Family Medicine
Fukushima Medical University
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Ironically, the annual *sakura* (cherry flowers) season has just come to Fukushima when one month has passed since the first earthquake and tsunami hit us. Fukushima is famous for its *sakura*; we have the 1000-year-old *Takizakura* (cascade *sakura*), one of the three best cherry trees of Japan, and the *Hanamiyama* (cherry-blossom viewing hills) wholly covered by the blossoms. Cherry trees are in full bloom everywhere in mid and east Fukushima. Beautiful, yet not many people seem to drink sake, sing songs, or dance under the blossoms this year. It is difficult for us to decide between the two options this year – to celebrate the season, or not. Sakura is the most spiritual flower for the Japanese. A few of you may recall that a *sakura* tree with drifting blossoms on the wind was used as the background of the last battle scene in the movie *The Last Samurai*, which implies the crowning glory, that is the "perfect (*migoto-na*)" death as the samurai.

We continue to be hit by large aftershocks day after day, night after night. According to the Japan Meteorological Agency, as of 3 pm on April 22, there have been 429 aftershocks with a magnitude of 5.0 and above, 74 registering 6.0 and higher and five at the 7.0 level or higher since the first one. We still do not have any positive reports that the Fukushima Daiichi nuclear power plant is settled.

One month is long enough that people despair when the situation does not seem to improve as they had expected. Let me take one of the most tragic examples. After being destroyed by the first earthquake on March 11, the waterworks department had worked hard to restore 97% of the water supply in Iwaki City. However, the aftershock of magnitude 7.0 smashed most of it again on April 11, exactly one month later. Not only the workers in the waterworks department of the city but also many citizens of Iwaki City felt as if they had worked in vain, like Sisyphus.

On April 4 I was standing in the ruins of the tsunami-hit community in Minami-Soma City looking out at the horizon of the Pacific. A nursing home was in front of me. Broken chairs, tables, beds, cabinets, wheelchairs, bookshelves, and many other things were scattered with tons of mud and debris everywhere. Badly damaged cars were rolled over in the yard and were even inside the building, which had no intact doors or windows. There was no evidence of life, but a local policeman said that more than 1,000 people were still missing from that city alone.

According to a National Police Agency tally at 3 pm on April 22, 14,172 people were killed and 12,392 were missing by the Tohoku-Kanto Earthquake. In Fukushima Prefecture, 1,432 people were killed, and 1,835 are missing. According to the Anti-Disaster Headquarters of the Fukushima Prefecture government, 25,936 people from Fukushima are living in evacuation shelters within the prefecture, and 29,833, outside the prefecture.

Since April 4, I have been working as a leader of the teams whose mission is to find, visit and take care of the people who cannot move by themselves and still live at home in the zone between 20 and 30 km from the nuclear power plant, just next to the exclusion zone. The teams of the first week of the operation consisted of about 50 people from the Self-Defense Forces, rescue squads, public health nurses from the local city/town governments, and doctors and nurses from Nagasaki University and Fukushima Medical University (FMU) Hospitals, co-organised by FMU and the Fukushima Prefecture government. In the first week of the operation, we took care of 299 persons at home in 3 cities, 2 towns and one village, with 223 persons being in Minami-Soma City.

Identifying who we needed to visit was difficult. We had to make a database of the target people by collecting information from several sources – from registers of several different health services, from making many phone calls and by going from house to house. Some had already been evacuated outside, while others had made the long journey back to Minami-Soma because staying in the evacuation centres was too difficult and their families were too exhausted to take care of them in the shelters. Some town governments had moved their whole town to other prefectures.

One of the weaknesses of Japanese primary care is that we do not have health register systems for the whole population. We cannot have an accurate grasp of the health status and needs of people in the communities without such health register systems. Although some hospitals in Japan are now making databases to show what kinds of diseases they treat in their hospitals, Japanese primary care doctors tend to be reluctant to share information on what kinds of patients they have seen.

A demented old couple whose nursing services had abruptly ceased since March 11 were taking care of each other. A family of three generations with a sick grandfather did not want to move because they cannot leave their beef cattle. An old man in wheelchair who used to be an engine driver transporting thousands of soldiers between Manchuria and Siberia after the Second World War said that life after this disaster was much better. A blind couple whose neighbours had all left for the shelters were having difficulty getting food and news to support their life. A son who was taking care of his old father with a colostomy has brought his father back from the shelters because people around them complained of odour from the pouch. These are only a few examples of the people I visited in the past 3 weeks. Rather than critical medical care in hospitals, what they need is to resume basic community-based services to support their lives at home, such as home helpers, balanced meals, bathing, rehabilitation, and oral hygiene.

The Japanese Government has just announced that it will widen the evacuation zone; people who live in the designated areas outside the 20-km no-go zone around the crippled nuclear power plant must evacuate the area in one month. We need to minimise the negative impact of this evacuation, especially on those who are heavily dependent on basic community-based services. I hope that the memories of Sakura of their home towns will help them to survive the evacuation.

The country is smashed, hills and rivers remain.

The city turns to Spring, plants and trees grow deep.

Moved by the moment, flowers splash tears.

Resentful of parting, birds startle the heart.

Du Fu: View in Springtime (757)
(Translated from the Chinese by Paul Rouzer)

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Health Exchange [http://healthexchangenews.com]

Beyond the Day after Tomorrow: Community Health in Japan

Ryuki Kassai
Professor and Chair
Department of Community and Family Medicine
Fukushima Medical University
Posted on 6 July 2011 by Admin01

When the earthquake, tsunami and subsequent aftershocks hit Japan in early 2011, health systems and staff were tested to the extreme in trying to meet people's health needs. Ryuki Kassai, from the Department of Community and Family Medicine, Fukushima Medical University, tells the story of what happened and the lessons that he and other medical professionals learned from their experiences.

On Friday afternoon, March 11, 2011, the first earthquake and tsunami hit us in the Pacific Coast areas of the Tohoku region (the northernmost region of the main island of Japan). The disaster that we now call the 'Great East Japan Earthquake' was caused by the strongest earthquake ever recorded in Japan (magnitude 9.0) followed by a 15-metre tsunami and hundreds of aftershocks.

Ryuki Kassai with a team next to the exclusion zone, Minami-Soma City.
Credit: Member of Self Defense Forces (SDF)

According to the Japan Meteorological Agency, as of 8:00 am on May 21 there have been 459 aftershocks with a magnitude of 5.0 and above, with 76 registering 6.0 and higher and five at the 7.0 level or higher. According to a National Police Agency tally as of May 20, 15,148 people are dead and 8,881 are missing with 91,484 houses/buildings completely destroyed and 40,454 partially destroyed.

A major lesson from the first few days of the disaster was the need to resume information networks as quickly as possible. The telephone circuits were immediately shut down, due to the overload in the affected areas. Although the Internet was alive, its use was limited by the availability of computers and electricity. It was difficult for us to get a whole picture of what was going on in the prefecture and the region overall.

Hundreds of patients were evacuated from community hospitals and nursing homes in the severely damaged tsunami-hit areas, especially in the towns very close to the Fukushima Daiichi nuclear power plant, and were transferred in chartered buses to facilities in safer places. Those evacuations had to be operated without notice to the receiving facilities. Damage to the electronic medical record systems of the sending facilities resulted in referral/transfer without necessary patient information about their medical condition. We need to invent some innovative telecommunication systems that can survive the acute initial period of grave disasters, by collaborating with the local/national governments, police, paramedics, telecommunication companies, the Internet services, academics in technology etc.

People in Fukushima, especially those who have young children, nursing or pregnant mothers in their families, are very worried about potential risk of thyroid cancer to children after the nuclear accidents. They sometimes complain that

Ryuki Kassai, MD, PhD, MRCGP Professor and Chair
Department of Community and Family Medicine Fukushima Medical University
1 Hikarigaoka, Fukushima 960-1295 Japan E-mail: ryukikas@fmu.ac.jp

they do not know what to do, or what not to do, and that they are not given essential information for their decision-making.

Unfortunately, we still do not have high quality standardised evidence-based information to assist us. By collaborating with people around the world, we need to construct a database of evidence-based information/references on immediate, short- and long-term effects of ionizing radiation, as well as of several kinds of disasters, and interventions and strategies to alleviate the effects. On the other hand, we know that scientific evidence cannot be generated without bias. A gap always exists between scientific evidence and daily practices in reality. In order to apply evidence into our practice/decision-making, we have to take several contextual factors into account.

Another lesson I have learned is the need for good collaboration between specialists in the hospitals and primary care physicians, after the disaster, even in the acute disaster period. If many patients with primary care problems had not been rushed into secondary/tertiary care hospitals after the disaster, the function of the hospitals would not have been affected so much. I found that care of the weak (frail elderly, children, pregnant or nursing mothers, people with chronic illness, mental illness, or multiple co-morbidity) was easily left behind in the acute disaster period without well-functioning primary care providers.

Japan has weak systems of primary care, which have become much more conspicuous since we were affected by the disaster. Many primary care doctors in the communities stopped seeing patients and they did not work within networks to serve communities. Several primary care assistance teams visited the affected areas, but it was often difficult for the local governments and people to coordinate such sporadic aid from several different prefectures in Japan.

During the past two months I have been working as a leader of the teams to help people who cannot move by themselves and still live at home in the zone between 20 and 30 km from the nuclear power plant, next to the exclusion zone. In the first week of the operation, we took care of 299 people at home in three cities, two towns and one village. Identifying who we needed to visit was difficult. We had to make a database of the target people by collecting information from several sources: from registers of several different health services, making many phone calls and by going from house to house. This is another weakness of Japanese primary care; we do not have health register systems for the whole population. We cannot have an accurate grasp of the health status and needs of people in the communities without such health register systems.

It is hard for us to resolve all the difficulties in the aftermath of the disaster. However, it is my hope that we can make good use of what we have experienced and learn to reconstruct at least some systems in better ways.

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The First Anniversary of the Japanese Tsunami

Ryuki Kassai
Professor and Chair
Department of Community and Family Medicine
Fukushima Medical University
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According to the plan, we should be well along the path to rebirth, but in reality, foolishness has continued, and nihilism and despair have only spread.

Hayao Miyazaki: Nausicaä of the Valley of the Wind (1994)
(Translated from the Japanese by Matt Thorn)

In the afternoon on March 11, 2012, I was standing on the tsunami-hit coast in Iwaki, Fukushima Prefecture, gazing alternately at the Pacific Ocean and the ruins of the town. The Pacific looked beautiful. On the opposite side, however, there spread a vast expanse of bare land, where, on the first anniversary of the disaster, several people came to pray for those who were killed by the Great East Japan Earthquake, and in particular the victims of the ferocious tsunami which hit there on March 11, 2011. It seemed to me that several of them were still looking for some shred of evidence that would make them believe their loved ones were not dead after all. One year on, how far — if at all — have we progressed towards full recovery? How much have we accomplished in terms of the reconstruction of our society?

According to a national police agency tally as of March 21, 2012, in the three most affected prefectures in the Tohoku region: 4,671 people were killed in Iwate, 9,512 in Miyagi, and 1,605 in Fukushima. 1,237 people were missing in Iwate, 1,688 in Miyagi, and 214 in Fukushima. 20,185 houses were totally destroyed in Iwate, 84,749 in Miyagi, and 20,194 in Fukushima; and 4,562 houses were more than half destroyed in Iwate, 147,165 in Miyagi, and 65,733 in Fukushima. The reconstruction headquarters reported on the 26 January 2012 that there were still 341,411 people living in evacuation shelters, in the houses of relatives or friends, or in temporary accommodation far away from their home towns.

Although Fukushima has fewer victims compared with Iwate and Miyagi, we probably have the largest number of evacuees, who now live in and outside the prefecture but who used to live along the coastal areas of Fukushima. A series of accidents at the Fukushima Daiichi nuclear power plant have rendered homeless the people from 7 towns and 2 cities. It seems too difficult for most people in Fukushima, as perhaps in the rest of Japan, to get a balanced understanding of the long term risk from low dose radiation. Even many doctors, nurses, and their families have left Fukushima, afraid of the possible fatal effects of radiation. Emotion beats scientific evidence.

Let me share an episode that happened last summer to illustrate people's irresistible fear of the invisible threat. *Obon* is one of the Japanese folk customs to honour the departed spirits of one's ancestors, who are believed to revisit their home towns during *Obon*. It has both Buddhist and Shinto influences. *Obon* was originally celebrated on the fifteenth day of the seventh month of the lunar calendar, but in modern Japan it has been varied among the regions of Japan. It is now most commonly around August 15. During the *Obon* holiday, people return to their ancestral home towns and, together with family/and friends, hold reunions with their ancestors' spirits. At the end of *Obon*, we light *Okuribi* (send-off fire) on

Ryuki Kassai *is professor and chair at the Department of Community and Family Medicine, Fukushima Medical University. He is a member of the BMJ editorial advisory board.*

the ground to send off the spirits of deceased family members, who are believed to return to the spirit world. The most famous *Okuribi* must be the *Daimonji*, or the *Okuribi* at Gozan (the Five Mountains) in Kyoto on August 16. Last summer, however, many people in the Tohoku region had watched the *Daimonji* on TV with mixed feelings. Pine trees from Rikuzentakata, in the Iwate Prefecture, where 1,487 were killed by the disaster, were supposed to be sent and burnt as firewood for the *Okuribi* fire at Gozan in Kyoto by invitation. However, the local people in Kyoto got so anxious about possible nuclear contamination of the firewood, its smoke and ashes, that they refused to use the wood from Rikuzentakata, even though the city is located some 200 km from the Fukushima Daiichi reactor. Complaints, criticism, and controversy continued for months.

Several plans for reconstruction following the disaster have been proposed in vain due to poorly-collaborating stakeholders in our society. A large number of medical professionals, researchers, politicians, musicians, and even restaurant chefs came to the affected communities and tried to help us, encourage us, entertain us, and heal us. But sadly, the hidden agenda of some of them seemed just to become famous for the sake of their own interest. Their visits and thoughtless behaviour threw the communities into confusion. Their priority seemed to be to undertake highly visible projects no matter how little they met people's needs in the affected communities. I myself would like to rebuild a community-based primary care system, a more sustainable one than before, along the affected coast of Fukushima through programmes of capacity building and social networking. However, it has been difficult for long-term human resources projects like this to attract the support of policy makers and academics.

The quotation at the beginning of this blog is from the popular cartoon by the acclaimed animation director Hayao Miyazaki entitled *"Nausicaä of the Valley of the Wind."* It is a story of reconstruction over 1000 years after a foolish series of wars devastated much of our planet. Humanity clings to existence at the fringes of a vast, polluted forest inhabited by monstrous insects. The struggle for existence escalates into another series of wars between humanity and the insects, as well as among the humans. Only Nausicaä, the princess of the tiny kingdom of the Valley of the Wind, knows the environmental significance of the forest. She turns her caring gaze towards all the creatures in harmony with the healing power of the forest. In Nausicaä, Miyazaki seems to explore how we have to pay for our mistakes after we have destroyed our environment.

As early as two weeks after the disaster we had found ourselves somehow insensitive to what was happening around us. Daily tragic news and reports came and went, passing in front of us like a silent slide show. After several months of an active reconstruction phase, it seems to me that we are now experiencing a second apathetic phase around the first anniversary of the disaster. It seems easy for the media and journalists to tell anniversary stories, and they eventually broadcast and published a lot of them worldwide. But for most of us people in the affected areas, the scenery remains rather the same; nothing much has changed.

After becoming a disaster victim myself, I now understand that it was not hard to care about the events in Fukushima. They just happened in front of us. What is more difficult, however, is for us now to feel a doctor's compassion toward people's sufferings in other parts of the world. Tragedy can happen anywhere and at any time: the big earthquake in China, the flooding in Thailand, the cyclone in the Philippines, and the riots in several areas of the world. The information comes to us continuously through the internet, emails, Facebook, Twitter and so on. If we are not sensitive enough, they too appear just as a series of silent slide shows. We need to survive the apathetic phase again by keeping our medical caring gaze turned towards what is happening to people elsewhere in the world, as well as in Fukushima.

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Disaster in Japan: A New Medical Gaze

Patrick Hutt Clinical Associate, Salaried GP and Deputy Editor InnovAiT

Ryuki Kassai Professor and Chair, Department of Community and Family Medicine, Fukushima Medical University

On March 11, 2011, disaster struck Japan. A magnitude 9 earthquake followed by a tsunami hit the east coast of Tohoku and Kanto. Thousands of people have been killed, more people have been left homeless, and the headlines around the world now give their attention to the damaged nuclear reactors in Fukushima. This disaster poses particular challenges for Japan and symbolises a more general dilemma for health professionals observing around the world.

In Japan, relief efforts have focused on rescuing trapped or stranded people, evacuating those in unsafe areas, and providing basic shelter, water, food, and medicines. Despite establishing the emergency management committee and activating 120 field units,[1] the government has faced some criticism for not acting more swiftly following the disaster.[2] The evolving figures are shocking. On April 12, 2011, Reuters reported that 13,843 people were confirmed dead by Japan's National Police Agency, while 14,030 were missing.[3] It was reported that 136,481 people remained in shelters, with the majority of the 70,000 people previously living in the 20 kilometre nuclear exclusion zone thought to have left their homes. A request for international aid has been issued. The challenge faced by rescue workers includes poor access to affected areas, flooded hospitals, an older population, and growing fears about the safety of food and water supplies.[3] Potassium iodine tablets are being distributed to limit the impact of radiation exposure.[4]

That such a nuclear problem should befall Japan, considered one of the exemplars of ‘safe' nuclear power, has prompted many other countries to take note.[5] In the coming months more details will inevitably emerge regarding the details that led to the nuclear accident. However, despite the understandable concern about the Fukushima nuclear reactors, some have argued that a disproportionate amount of media time has been spent covering the explosion, as opposed to the human tragedy of those killed, injured, and displaced by the earthquake.[6]

STRENGTH OF FAMILY MEDICINE IN FUKUSHIMA

For many involved in general practice, it is particularly sad that Fukushima has overnight become known for a disaster when it had been slowly fostering a reputation for very different reasons. Fukushima, a rural and industrial area that has traditionally struggled to attract enough doctors to serve its aging population, now boasts one of the first structured family medicine training programmes in Japan.[7] As such, it has received a number of international visitors interested to see how a generalist approach fares in one of the most high-tech hospital dominant countries in the world.[6,8]

In the subsequent days after the first earthquake, trainees in family medicine at Fukushima Medical University, spread around the small communities of the prefecture, were communicating again by teleconference. They have been working hard in the forefront of care at community-based hospitals and clinics. At their regular teleconference sessions, the forum in which they normally meet for teaching sessions, family medicine trainees shared the common challenges faced in the

Figure 1 Registrars and medical students at the Family Medicine Resident Forum, Fukushima Medical University, 23 April 2011. The Forum provided the first opportunity to listen to what each attendee had experienced in person (not by teleconference) since 11 March.

aftermath of the earthquake. These included the difficulties of providing communities and local government with pertinent advice about ionising radiation, triaging frail older people in order to evacuate them to institutions inland, and maintaining their clinical facilities without enough information, water, electricity, and petrol.

TRAGEDIES IN MODERN CONSCIOUSNESS

For observers around the world, the tragedy left many people who have friends and family in the affected areas desperate for information and keen to help however they can. For those with a less tangible connection to Japan the news of the earthquake perhaps poses a more general dilemma. The distance from Fukushima to the UK is over 9000 kilometres yet the images of the earthquake, the tsunami, and the failed nuclear reactors for the wider international audience are only centimetres away. Within minutes to hours video footage was freely available on YouTube, blogs, Twitter, and rolling news stations. Tragedies around the world are now part of the modern consciousness, such as the recent mud-slides in Brazil, the earthquake in New Zealand, and the upsurge in conflicts in the Middle East. How does one — from a distance and proximity — make sense of such events ?

When Michel Foucault coined the term the 'medical gaze' in the 1960s, it related to the way in which doctors in the 18th century learned in hospitals to see beyond the surface of bodies, to see organs and pathophysiology, and to distance themselves from human suffering.[9] Now the 'medical gaze', increasingly cultivated in general practice, has a holistic focus[10] with a greater emphasis on patient experience and community orientation in contrast to the 18th century teaching at the Hotel-Dieu; the factors influencing the 'medical gaze' change with time.

As the default exposure to world events increases, it is important that the 'medical gaze' is mindfully international, so that it can better harness this exposure, even if at times solutions and meaningful words will be hard to find. For example, it would be helpful for the international community to construct a database of evidence-based information/references on immediate, short-, and long-term effects of ionising radiation, as well as the impact of other kinds of disasters, looking at interventions and strategies to alleviate their effects, especially from the viewpoint of primary care. Appropriate teaching tools would also be useful. In the UK, it is encouraging that GP trainees are now invited to spend more time overseas with Out of Programme experience.[11] A more global view of health may be further facilitated as arguments for an international curriculum gather momentum.[12]

RELIEF EFFORTS AND MEDICAL CARE

Japan will require help in the months and years to come. In practical terms, international aid agencies are best placed to respond initially in the aftermath of natural disasters, but require the support of those who are able to donate time and/or money. As relief efforts continue it is welcome that governments, international agencies, and professional organisations have expressed their solidarity with the people of Japan. Nuclear power deserves to be debated globally and safer sustainable power sources sought. In particular, lessons can be learned for the UK with regards to the role of primary care if confronted with a similar nuclear tragedy. It is important that political differences about the future direction of Japan's medical system are put to one side as it unites against the challenge posed by the disaster.

Medicine is now a truly global profession,[13] whose connections and potential are continually emerging. This may mean exposure to news of more disasters, but more importantly it is an opportunity for greater understanding, hope, and solidarity. Around the world, colleagues in general practice face challenges that can inspire acts of great human endeavour despite adversity.

Notes

Provenance

Commissioned; not externally peer reviewed.

Competing interests

Patrick Hutt visited the Fukushima family medicine training programme in 2008, staying as a guest of Professor Kassai and his colleagues. Ryuki Kassai established the vocational training scheme in general practice in Fukushima and is a citizen of Fukushima.

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Radiation Measurements at the Campus of Fukushima Medical University

Through the 2011 Off the Pacific Coast of Tohoku Earthquake and Subsequent Nuclear Power Plant Crisis

Tsuneo Kobayashi

Department of Natural Sciences (Physics), School of Medicine, Fukushima Medical University, Fukushima, Japan

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Abstract : An earthquake, Tohoku region Pacific Coast earthquake, occurred on March 11, 2011, and subsequent Fukushima nuclear power plant accidents have been stirring natural radiation around the author's office in Fukushima Medical University (FMU). FMU is located in Fukushima City, and is 57 km (35 miles) away from northwest of the Fukushima Daiichi nuclear power plant. This paper presents three types of radiation survey undertaken through the unprecedented accidents at the campus and the hospital of FMU. First, a group of interested people immediately began radiation surveillance ; the group members were assembled from the faculty members of "Life Sciences and Social Medicine" and "Human and NaturaI Sciences." Second, the present author, regardless of the earthquake, had serially observed natural radiations such as gamma radiation in air with NaI scintillation counter, atmospheric radon with Lucas cell, and second cosmic rays with NaI scintillation. Gamma radiation indicated most drastic change, i.e., peak value (9.3 times usual level) appeared on March 16, and decreased to 1.7 times usual level after two months. A nonlinear least squares regression to this decreasing data gave short half-life of 3.6 days and long half-life of 181 days. These two apparent half-lives are attributed to two groups of radioisotopes, i.e., short half-life one of I-131 and long half-life ones of Cs-134, Cs-137 and Sr-90. Also, atmospheric radon concentration became high since a stop of ventilation, while second cosmic rays did not show any response. Third, late April, 2011, a team of radiation dosimetry under the direct control of Dean, School of Medicine, was established for the continuation of radiation survey in the campus and the hospital of Fukushima Medical University.

Key words : *Fukushima Daiichi nuclear accidents, earthquake and tsunami, radiation surveillance, natural radiation*

INTRODUCTION

Fukushima Medical university (FMU) is located in the northeastern region of Japan (37°45'N, 140°28'E, 67.4 m above sea level), and is 57 km (35 miles) away from northwest of the Fukushima Daiichi nuclear power plant. The Tohoku region Pacific Coast earthquake occurred on 11 March, 2011, and Fukushima nuclear power plant accidents broke out subsequently.

The present paper reports three groups of radiation measurement performed through the unexampled accidents. First, immediately after the earthquake, in order to investigate the levels of radiations outside and inside the campus, Associate Dean, School of Medicine, Professor Hiroyuki Yaginuma assembled a group of interested people from the faculty members of "Life Sciences and Social Medicine (basic medical sciences)" and "Human and Natural Sciences (liberal arts course)." Their hard-working efforts gave valuable information about radiation safety for many staff and patients in the hospital of FMU and the staff and students of FMU campus.

Second, the present author had been measuring several natural radiations[1] around his office from September in 2010. The natural radiations under the serial measurement were : gamma radiation in air with NaI scintillation counter, atmospheric radon with Lucas cell, and second cosmic rays with another NaI scintillation counter. Amongst the results of serial observation, gamma radiation showed the most drastic change, i.e., peak value of 9.3 times as usual level occurred on March 16, and exponentially decreased to 1.5 times of usual level after five months. A nonlinear least squares regression to these data indicated short half-life of 3.6 days and long half-life of 181 days. The first apparently short half-life (later referred as HL) is attributed to the existence of I-131 (HL : 8 days), while the second long HL may be contributions from nuclides of Cs-134 (HL : 2 years), Cs-137(HL : 30 years) and Sr-90 (HL : 28.1 years). Also, the atmospheric radon concentration at the other place became high because of a stop of ventilation. Atmospheric radon at other places and second cosmic rays did not show any distinct response.

Third, several weeks after the accidents, a team of radiation dosimetry under the direct control of Dean, School of Medicine, Prof. Hitoshi Ohto, was established for the continuation of radiation survey in FMU.

Material and Methods

1. Radiation surveillance right after the magnitude 9.0 earthquake

Associate Dean, School of Medicine, Professor H. Yaginuma supervised radiation surveillance groups of interested people mentioned above. An NaI(Tl) scintillation counter surveyed radiation in several places in Fukushima Medical University hospital, i.e, ICU, NICU and pediatric ward. In the early stage, Japanese Self-Defense Force officials conducted patients screening with Geiger counters at the entrance of hospital with the help of this surveillance team.

2. Serial natural-radiation measurements from Septermber 2010

NaI scintillation counter

A3″×3″ NaI(Tl) scintillation detector (Teledyne S-1212-T, 7% resolution for Cs-137) was observing gamma radiation in air at the author's office since October 2010. Every four hour counting data was stored in a personal computer. The present report discusses only gross dose rate expressed as a unit of cps. The office room was on the fourth floor of the five storied concrete building built in 1988.

Radon detector

Passive type detectors (Pylon, AB-5) had been measuring atmospheric radon concentration at three places, i.e., the author's office room, students' lab and the Radioisotope Center. Another active type radon detector (Durridge, RAD7) had been detecting atmospheric radon in the author's room. Both types of detector were acquiring every one-hour data and stored in memories and/or printed out to papers. All these detectors safely continued measurements in spite of the magnitude 9.0 earthquake.

Second cosmic rays

For the observation of cosmic rays, a 1″×1″ NaI(Tl) scintillation detector (Harshaw 905-3, 7% resolution for Cs-137) had been counting radiation whose energy is over 3 MeV. These data were also stored in a personal computer.

3. The team of radiation dosimetry under the direct control of Dean, School of Medicine

The team of radiation measurement under the direct control of Dean, School of Medicine, used mainly NaI(Tl) scintillation counter for hospital and campus surveillance, and again Geiger counters checked mats in entrance hall and shoes-soles of students after exercise of sports in the ground of the campus.

Results

1. Radiation surveillance right after the magnitude 9.0 earthquake

From the beginning stage of the power plant crisis, Associate Dean, School of Medicine, Professor H. Yaginuma emitted the information of radiation surveillance, acquired from his teams, to FMU staff. In particular, outdoor gamma radiation results were reported on a bulletin board up to the present. Maximum of the observed value was 11.9μSv/h at 11:30 on March 16, 2011. The outdoor gamma values are around 0.4 μSV/h nowadays.

Ward surveys were not announced officially, however ward members were able to have no worries about indoor radiation.

Patients screening services at the entrance of the hospital continued until March 25, 2011. People whose cps exceeded 10,000 cpm were required decontamination at the separate 'decontamination tent.' The maximum value found was 100, 000 cpm. All members of FMU appreciate the aid of the staff of Japanese Self-Defense Force officials.

2. Serial natural-radiation measurements from September 2010

Gamma radiation in air

Figure 1 shows gamma radiations with the NaI(Tl) scintillation detector. Just when the magnitude 9.0 earthquake happened, there was no change for the counts. As indicated in the figure, radiation dose reading began to elevate about 18:00 on April 15 and reached the

Tsuneo Kobayashi
Corresponding author : Tsuneo Kobayashi E-mail address : tkoba@fmu.ac.jp
http://www.jstage.jst.go.jp/browse/fms http://fmu.ac.jp/home/lib/F-igaku/

maximum value of 9.3 times as usual values. This sudden increase was attributed to the hydrogen explosion at the nuclear power plant. Thereafter, the counts seemed to attenuate exponentially. This early exponential attenuation was expressed roughly 3 days of HL that was attributed to the existence of I-131 (HL : 8.06 days). This early environmental HL of 3 days was reasonably shorter than the physical HL of I-131.

After one month has passed, semi-log plot of the cps versus time did not fit to a single line and the apparent HL became longer and longer, indicating the appearance of the second long HL. Thus, the author tried a model equation of $CPS=a2^{-t/Ta}+b2^{-t/Tb}$, where Ta is the short HL and Tb is the longer HL. Nonlinear least squares regression, using a command, nls, of S-PLUS[2] or R[3], obtained the value of Ta=3.63±0.02 days and Tb=181±5 days. This second longer HL increased longer and longer afterwards and reached 181 days after about five months

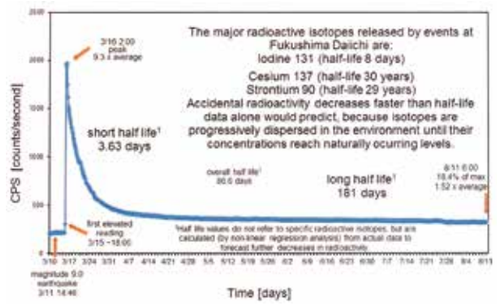

Fig. 1. Serial gamma radiation measurements in air with sodium iodide (NaI) scintillation counter before and after the magnitude 9.0 earthquake, tsunami, and subsequent nuclear power plant crisis. Results were stored every 4 hours as the average cps from the accumulated counts. Measured place was Fukushima Medical University Department of Natural Sciences (Physics) professor's office. Radiation surveillance is a routine activity of this department.

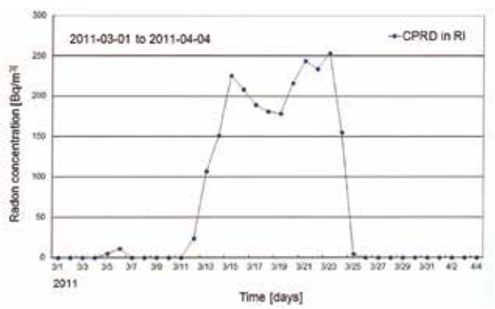

Fig. 2. Change of atmospheric radon concentration after the magnitude 9.0 earthquake in a room of the Radioisotope Center. CPRD means continuous passive radon detector (Pylon, AB-5).

(144 days after the peak value was observed). This long HL might be contributions of newly supplied radioisotopes from nuclear reactor or environmentally accumulated long HL isotopes such as Cs-134, Cs-137 and Sr-90. The value of b/(a+b) was 0.13 that means long HL radioisotopes in FMU were 13% at the first attack of the explosion of the reactor to Fukushima.

Atmospheric radon

Figure 2 shows the change of atmospheric radon in one room of the Radioisotope Center. This Center is normally ventilated extremely because of the prevention of non-sealed radioisotopes. This extreme ventilation stopped when the earthquake broke out and RI users were immediately prohibited to enter. The stop of ventilation naturally raised atmospheric radon concentration as indicated in the Figure 2.

Usual radon level was quite low and less than the lower detection limit of the device (5 Bq/m³), while after the ventilation stopped, it raised as high as 250 Bq/m³ that exceeds intervention level of the U.S.A.(150 Bq/m³) or Europe (200 Bq/m³). The origin of the elevated radon might be the thick concrete wall of the room that was devised to handle sealed radiation sources. Although the level became high, there was no problem of radiation protection because people were inhibited to enter during the accident.

Radon level at other places also became slightly high after the earthquake, and again the ventilation stopped for about 10 days. However, the level did not exceed usually observed maximum level since these rooms have not so thick concrete as RI center's room.

Second cosmic rays

Second cosmic rays showed a little decrease and growth through the earthquake. However, these changes were explained with the contrary change of the atmospheric pressure ; second cosmic rays decrease when the atmospheric pressure increases (thicker air disturbs cosmic rays to reach the ground). Atmospheric pressure at the time was later checked with the data from automated meteorological data acquisition system (AMeDAS) of Japan Meteorological Agency.

3. The team of radiation dosimetry under the direct control of Dean, School of Medicine

The results of surveillance by the team of radiation dosimetry under the direct control of Dean, School of Medicine, are informed to FMU staff twice a month nowadays. Indoor levels are now no problem, while outdoor values are a little high, especially on some 'hotspots.' However, times for students' club activities outside are not so long, and they can be careful not to

stay too long near those hotspots.

Discussion

From the early stage of the increase of gamma-ray background caused by the crisis in Fukushima Daiichi nuclear power plant, the author distributed the data as Figure 1 to the relevant people within the campus almost every day, to confirm that there was no further accident in the nuclear power plant. Frequency of the data distribution became roughly once a month nowadays. The audience of this information asked the author several questions.

"How could we translate the unit cps in Figure 1 to more familiar unit of μSv/h?" This was a serious but quite difficult problem. The author had no high precision dosimeters for environmental level. Only a pocket dosimeter (Panasonic, ZP-145) was placed in the author's office from the 18th of March, and comparing cps of NaI with this tiny dosimeter, a conversion factor of 9.4×10^{-4}(μSv/h)/cps was temporarily obtained. The author intends to get more precise dosimeter.

"The reason of the increase of long half-life is the influence of supplies from nuclear reactor?" Concerning this question, there is an interesting report by Meteorological Research Institute[4]. This report says that the fallout of Cs-137 away from the Chernobyl nuclear disaster faded environmentally with the half-life of 25 days. Thus, the present author guessed that the newly supplied radioisotopes from Fukushima Daiichi nuclear power plant might be the origin of the half-life longer than 25 days. Nowadays, however, environmentally accumulated long HL radioisotopes such as Cs-137 might be the main origin of the apparent half-life longer than 100 days.

"ls the expression with half-life really appropriate for the change of cps?" The answer is not so clear either. However, radioisotopes from nuclear power plant are divided into two groups, i.e., with short half-life one (I-131) and with long half-life ones (Cs-134, Cs-137 and Sr-90). Therefore, the idea of the sum of two groups of RI with different half-life may be one of the simplest models, at the present time of three months or 100 days after the accident.

Conclusions

Three groups of radiation survey through Tohoku Region Pacific Coast Earthquake and the subsequent Fukushima Daiichi nuclear disaster were reported. First, at the head of Associate Dean, School of Medicine, the group of interested people assembled from the faculty members of "Life Sciences and Social Medicine" and "Human and Natural Sciences" began radiation surveillance immediately after the earthquake, and gave precious information and confirmation of a sense of security for the staff of Fukushima Medical University. Second, serial measurements of natural radiation revealed various responses from the nuclear power plant accidents. For the gamma radiation data, non-linear least squares fit indicated short and long half-life decrease of the radiation. Shorter half-life is clearly recognized as the contribution of iodine 131, while longer half-life is attributed to the radiation from cesium-134, cesium 137 and strontium 90. Third, the team of radiation dosimetry under the direct control of Dean, School of Medicine, started late April and continues the surveillance and will continue for all the people in Fukushima Medical University.

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Fukushima Symposium: A Brief Note

Ikuo Wada[1] and Hitoshi Ohto[2]

[1]Dean, Graduate School of Medicine, Fukushima Medical University School of Medicine, Fukushima, Japan, [2]Dean, School of Medicine, Fukushima Medical University School of Medicine, Fukushima, Japan, Vice President, The Fukushima Society of Medical Science

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Snow rarely falls in March here in Fukushima. Though, on the particular evening that the Fukushima Daiichi nuclear power plant spilled enormous amounts of radioactive materials into the environment, it was snowing.

Fukushima City recorded nearly 20μSv per hour of radiation that night despite being about 60 km away from the plant. The radioactive materials contained in the snow seeped into the ground. This was the same ground that had given the people of Fukushima Prefecture a fruitful life.

From that day on, the accident has been nothing but torture to the people even though radiation levels have dropped to one tenth of the initial levels. The passing of several months has failed to heal the suffering caused by extreme anxiety and the mental crisis of which the people are faced with.

The Fukushima Society of Medical Science, an affiliate of Fukushima Medical University, has been struggling to protect people's health. In July, the society asked a wide variety of experts evaluating the current situation of Fukushima to hold a symposium with the theme of protecting citizens. Because of the size limit of the hall, the audience was restricted to schoolteachers, hospital doctors, journalists, the police and the Self-Defense Forces. The latter mentioned Self-Defense Forces are in direct contact with citizens and are involved in the rescue services. A local radio station later broadcasted the symposium.

An Dr. Naoki Matsuda at Nagasaki University addressed the opening lecture on basics of radiation and general health effects at the symposium. Fukushima Medical University's Dr. Tsuneo Kobayashi, a radiology physicist, gave precious and precise information on environmental radiation observed at Fukushima Medical University before and after the accident. Also, Dr. Katsuhiko Yamaguchi reported their surveillance of radiation in Fukushima Prefecture by dosimeters laid on a car. Dr. Noboru Takamura, who has been studying the health effects of the Chernobyl nuclear power plant accident in 1986, summarized his research. As another example of radioactive spillage, Dr. Kenneth Nollet gave a brief talk on his personal experience in the U.S. while growing up.

Concluding the second half of the session, Dr. Tomotaka Sofue, from the National Cancer Institute, explained his approach of evaluating radiation health effects in comparison to various health risks such as smoking, improper food intake or lack of exercise. From a sociology point of view, Dr. Naoya Sekiya analyzed how fear spreads among people often causing otherwise-unnecessary panic. Finally, we heard Dr. Kenji Kamiya, a professor of Hiroshima University and now also vice-president of Fukushima Medical University, talk about the challenges faced in Fukushima during the period of emergency. Professor Kamiya also talked about his studies and other studies concerning the cellular DNA recovery system after radiation injury.

This symposium was our attempt to seek the way to properly estimate the health risk of radiation. As effects of low level radiation has been under debate, we did not seek a clear answer. Rather, we wished citizens to know what was certain and what wasn't. We hope that the symposium provided people in Fukushima Prefecture with an opportunity to consider their health risk based on trustworthy data, and that our experience can be of help to people around the world.

Ikuo Wada, Hitoshi Ohto
http://www.jstage.jst.go.jp/browse/fms http://www.fmu.ac.jp/home/lib/F-igaku/

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Reports from Disaster-Affected Areas

Effects of the Nuclear Accident on the Community: Unique Aspects of the Fukushima Disaster

Kazunobu Ishikawa

Notes from the 53rd Annual Meeting of the Japan Geriatrics Society
Panel Discussion 4: Geriatric Medical Care in Times of Disaster—How to Protect the Elderly in Evacuation Centers

Summary

The Fukushima disaster is unique in its characteristics and repercussions. In addition to the earthquake and tsunami causing catastrophic damage to the municipalities of Hamadori, many people were ordered to evacuate their homes and abandon their livelihoods due to widespread radiation contamination; the extent and dangers of contamination were still unclear at the time. Moreover, with domestic and foreign people steering clear of the disaster areas, given their fear of radiation, Fukushima suffered economic loss and psychological pressure.

Local government agencies and medical facilities strived to address this unprecedented event, which suddenly occurred during the light snow of early spring. During the early stages, we faced the harsh truth that our work depended on the provision of water, electricity, gasoline, communication, and the transportation systems. DMATs and radiation exposure medical teams collaborated with local medical teams. While those involved in the restoration efforts at the nuclear power plant were facing more serious issues, we visited the 25,000 people living in evacuation centers within the prefecture and provided aid to patients within 20–30 kilometers of the nuclear power plant, who had been ordered to stay indoors.

I believe everybody gained experience of aspects outside of their professional expertise through these unexpected events. In addition, people have learned that organically grown organizations and personal relationships can help us respond to these types of changes, and that easy-to-understand explanations help bring about peace of mind. There are many similarities between medical care and safety management, which is the bedrock of nuclear power operations. We have suddenly been forced to reflect on our professional mission at a personal and organizational level. Sincerely analyzing our actions is our most significant responsibility toward those in the disaster areas, who now live under the burden of long-term radiation contamination.

Key Words: *Great East Japan Earthquake and tsunami, Fukushima, nuclear accident, large-scale evacuation, professionalism*

Introduction

The 9.0-magnitude Great East Japan Earthquake of March 11, 2011 was the fourth strongest quake in history, and surpassed in scale anything our country has ever experienced. In addition to the devastation in Fukushima, the earthquake and tsunami caused economic loss in and placed psychological pressure on the prefecture. These setbacks emanated from the fear and avoidance of radiation exposure due to Tokyo Electric Power Company's Fukushima Daiichi nuclear power plant accident, bringing to the fore aspects of an unprecedented disaster.

Effects of the Great East Japan Earthquake and Tsunami in Fukushima

According to the prefecture's disaster response headquarters, as of June 3, 2011, there have been 1,576 fatalities, 404 missing cases, 84 serious injuries, and 152

K. Ishikawa: Department of Cardiology, Center for Medical Education and Career Development, Fukushima Medical University Fukushima Medical University Hospital

cases with minor injuries. Unlike disasters in a large urban setting, the overwhelming majority of fatalities in this disaster along the Pacific coast (Hamadori) were due to drowning caused by the tsunami.

Of the 98,555 evacuees, 86,283 were ordered to evacuate because of the nuclear accident, 1,472 were given an evacuation advisory, and 10,159 voluntarily evacuated. Eighty-nine percent were evacuees from the nuclear accident (National Police Agency Survey, June 13). In addition, 23,880 people were evacuated to locations within Fukushima Prefecture (6,033 as primary evacuees and 17,847 as secondary evacuees), and 35,972 were evacuated to 37 prefectures across Japan. This shows that the evacuation locations were distant and spread out.

Medical Care in the Hamadori Area of Fukushima before the Disaster

Fukushima is the third largest prefecture in Japan in terms of area, and is home to 2,000,000 residents. Approximately 200,000 people live within the jurisdiction of Soso (Soma and Futaba) and 340,000 live within that of Iwaki. Approximately 25–26% of the population is above the age of 65 and 13–15% is over 75 (Fukushima Prefectural Statistics, September 2010). Fukushima has one of the most aging populations in the world, with an expected 5% increase in the elderly population every ten years. Meanwhile, there are only 183.2 physicians per 100,000 residents of Fukushima (the national average is 212.9; Ministry of Health, Labour and Welfare, 2008), and the prefecture ranks 37th in physicians-to-population ratio. A local medicine revitalization plan is being implemented in Soso to improve pediatric, obstetric, and emergency care.

Fukushima Disaster Medicine Support Network and the Role of the Fukushima Medical University Hospital

Immediately after the earthquake, the Fukushima General Medical Coordination Committee was organized to streamline information to accelerate responses to disaster medicine needs and the formulation of support plans. Fukushima Medical University (FMU) Hospital, a public entity and the only university hospital in the prefecture, has the functional advantage of being a prefectural hospital (long-term, interpersonal relationships). Thus, working in unison with the prefecture's Disaster Response Headquarters, the hospital sought to contact and coordinate with administrative agencies (at the national, prefectural, and municipal levels), medical associations, healthcare centers (welfare offices), and other medical facilities during the disaster.

After the disaster, 35 Disaster Medical Assistance Teams (DMATs) with 180 members gathered at FMU. For the first three days, they cared for 168 emergency patients (93 tagged green, 44 yellow, 30 red, and 1 black). The majority of these suffered only minor injuries. Also, unlike earthquakes in urban regions, such as the Great Hanshin Earthquake, there were few cases of seriously injured people rescued from the debris; most deaths were presumed to be due to drowning during the tsunami.

Elderly Patients and Mass Emergency Evacuations after the Nuclear Accident

Between March 12 and 16, the Tokyo Electric Power Company's Fukushima Daiichi nuclear power plant saw repeated hydrogen explosions and fires, which were triggered by complete power outage. This led to the dissemination of evacuation orders to those within a radius of 3, 10, and 20 kilometers from the plant, while those within 20–30 kilometers were instructed to stay indoors. Thus, victims of the earthquake and tsunami were left with no choice but to leave the evacuation zone by a private bus or their personal cars, and relocate to distant evacuation centers. Hospitalized patients and those in care facilities who could not move voluntarily were transported from the evacuation zones by Self-Defense Force helicopters as well as vans and ambulances from across the country.

The sudden stop of medical and nursing care (e.g., food and medical supplies) after the disaster, and the long-distance, day–night travel, with early spring's light snow, led to cases of hypothermia, cardiovascular events, dehydration, and debilitation. There were many victims who were elderly. Ten patients in three hospitals located within the 10 kilometer zone died soon after the disaster. Of these 10 patients, seven were elderly patients who were bedridden due to a stroke or suffered from ailments such as chronic heart failure and dementia. The deaths occurred not only at the transferee hospitals but also at the evacuation centers or in buses en route. During this time, approximately 1,000 inpatients and long-term care patients (elderly and handicapped) from hospitals within the 20 kilometer zone, and 1,000 inpatients and long-term care patients from hospitals within the 20–30 kilometer zone, were transported to medical facilities; local government agencies, the Self-Defense Forces, and the police coordinated operations at the transfer sites.

Within Iitate and the 30-kilometer evacuation zone, there are 35 geriatric care facilities, which were later ordered to conduct a planned evacuation because the annual radiodensities exceeded 20 mSv. There were about 2,000 elderly people in these facilities, showing how much of an effort was needed in these areas soon after the nuclear accident.

Table 1A: Medical Visits to Evacuation Centers

Reference dates for evacuation center information (April 1, 2011) March 28–April 28, 2011

Area	Evacuation Center		Number of evacuation center visits		Number of patients visited *1	Number of patient records *2
	Number of facilities	Number of evacuees	Totals	Actual numbers		
Kenpoku	73	8,376	32	24	5,231	746
Kenchu	74	8,679	37	23	4,477	622
Kennan	16	852	6	6	566	36
Aizu	44	3,816	20	14	2,272	177
Minamiaizu	21	61	0	0	0	0
Soso	16	3,084	22	12	2,248	562
Iwaki	58	3,387	47	16	1,040	252
Total	302	28,205	164	95	15,834	2,395

*1 Number of evacuees visited in the evacuation centers *2 Number of patient records produced

Medical Visits to the Evacuation Centers and Care for At-Home Patients in the 20–30-kilometer Indoor Refuge Zone

In the two–three weeks of the early stages after the earthquake, even medical facilities had trouble securing sufficient gasoline, kerosene, and other fossil fuels. Public transportation systems outside the urban areas are not very convenient; therefore, personal cars, used to go to school, work, or shop, play a major role in daily lives. About 85% of Soso's residents rely on personal cars to commute to hospitals (Fukushima Department of Health and Welfare Survey, January 2010). Thus, as of March 31, we began providing a wide range of medical support to those in evacuation centers and those at home who could not move around easily because of the effects of the disaster.

1. Medical Visits to Evacuation Centers (Table 1A)

Three weeks after the disaster, 302 evacuation centers had been set up in Fukushima, housing 28,205 evacuees. FMU conducted visits to these evacuation centers with four teams specialized in pediatrics, contagious diseases, deep-vein thrombosis, cardiovascular health, and psychiatric health. In the month of April (till the 28th), we visited 95 places, including 164 centers and 15,834 patients. Most consultations in the evacuation centers were for chronic diseases (lifestyle diseases) such as high blood pressure (27%), high blood lipids (6%), and diabetes (5%), followed by communicable diseases (e.g., fever, cold, and influenza; 18%) and orthopedic disorders such as backaches (9%). Portable vascular ultrasounds revealed that about 10% had deep-vein thrombosis; we taught these patients appropriate exercises and distributed stockings. Because the disaster occurred in winter, acute pulmonary embolism and thrombosis, which were major issues as people slept in cars after the Chuetsu Earthquake, was not a big issue for us. In terms of mental health care, from an early stage, psychiatrists and clinical psychologists listened to and prescribed medicines for victims complaining of depression, anxiety, or insomnia. The inadequate implementation of a comprehensive nuclear disaster strategy and the lack of information about when the evacuation order would be lifted, allowing all evacuees to return home, placed psychological stress on the victims. Table 1B presents issues and problems about life at the evacuation centers. During this disaster in which life as evacuees was prolonged for months, government officials, volunteers, and the victims themselves who visited evacuation centers to solve small problems all played a significant role.

Table 1B: Issues and Problems with Prolonged Life as an Evacuee

Earthquake and tsunami damage, evacuation zones, and planned evacuation zones

Many people sharing the same space (limited isolation from patients with a fever or contagious diseases)
Difficulty in maintaining appropriate indoor temperatures (winter or summer)
Poor air circulation (warm air leakage)
Limited hand washing and gargling (water shortage)
Bedding and mattresses (causing backaches, bedsores, insomnia, among other ailments)
Privacy (causing irritation, anxiety, anger, depression, high blood pressure, among other discomforts)
Long-term evacuation (leading to uneasiness, exhaustion, depression, among health-related disorders)
Limited movement (causing disuse syndrome, interrupted rehabilitation, among others)

2. Care for At-Home Patients in the Indoor Refuge Zone

Daily life was difficult for those in the 20–30 kilometer zone; many were ordered to stay indoors from

March 15 because of the nuclear accident, while several residents chose to evacuate voluntarily. Many companies were ordered not to go near the nuclear power plant; thus, delivery was discontinued for aid supplies as well as gasoline, kerosene, food, and medical supplies. In the early stages, most medical teams and volunteers did not enter Minamisoma, which is located within this zone. Therefore, the Self-Defense Forces had to stop by every house and transport those who could not move voluntarily. However, about 500 patients stayed at home immobile, refusing to be transferred; thus, a team from FMU, University of Nagasaki, and the medical association collaborated with the medical branch of the Self-Defense Forces to conduct at-home consultations. By the end of May, we saw 1,500 patients. We identified five residents who required hospitalization (debilitation, pneumonia, bedsores, Parkinson's disease, and degenerated schizophrenia), and we followed up accordingly.

A survey about the emergency evacuation of 164 at-home elderly who had difficulty moving and the evacuation conducted in Minamisoma in mid-April revealed that 68.3% obeyed the evacuation order, 26.8% refused to evacuate, and 4.9% did not declare a preference; this includes 54 bedridden respondents and 34 with difficulty walking. The results suggest that these respondents have little confidence in their own ability to move and prefer to live as evacuees receiving care.

Effects of Widespread Evacuation due to the Nuclear Accident on Patients and Families

In the early stages after the nuclear accident, the government did not release official data about atmospheric radiation diffusion. However, foreign agencies monitoring these levels constantly released data. In addition, taking into account the importance of weather conditions (e.g., wind direction, rain, and snow) and topography in terms of radiation dispersal, on April 23, Iitate and Yamakiya in Kawamata were designated as zones planned for evacuation within one month. At the same time, restrictions on the shipment and imports of agricultural and dairy products were also imposed, casting a dark shadow on the springtime harvest. Many residents, particularly the elderly who lived away from the coast and whose homes were not damaged, were unexpectedly ordered to evacuate. The evacuees from Fukushima surpassed 120,000 people. Many in agricultural villages were living in homes passed down through three generations and were living self-sufficient lives for years. However, because of the evacuation, and considering school, work, and commuting conditions, 35% of families are now scattered (NHK Survey, June 2011). More importantly, caring for the elderly had become an issue.

Professionalism in the Medicine and Nuclear Power Industries

Professionals must have expert knowledge, the eloquence to reassure the general public, a trustworthy sense of ethics and humanity, and an altruistic attitude. We must vigorously review the efficiency of our nuclear safety management systems and the role of nuclear officials during this accident. This must be done from the same perspective as that adopted when medical accidents lead to improvements in safety management and respect for patients in medical facilities. Each individual should earnestly reflect, from his or her own standpoint, on whether this disaster was considered unthinkable because it was “beyond imagination” or simply because it was “beyond jurisdiction.”

Unique Aspects of the Fukushima Disaster (Table 2)

In addition to an earthquake and tsunami of this scale being a once-in-1,000-years occurrence, the disaster that struck Fukushima is historically unique because it was combined with the radiation accident at the nuclear power plant, which modern society had developed in an effort to pursue convenience and efficiency. Furthermore, it brought out the fear of invisible radiation, the socioeconomic repercussions (and rumors) of our psychological aversion to contamination, and discrimination toward victims. Also, the aftereffects of the disaster appear to be long and harsh. So not to belittle the problem through the Japanese customary thinking that a disaster will pass as long as it is endured, or through the disposition of those in the Tohoku region to refrain from openly discussing matters, we must recast the burden of the disaster areas as a narrative. Moreover, the Japanese society must work in unison to reduce the impacts of the disaster, no matter how long it takes. Finally, it is crucial for us as individuals, (medical) organizations, communities, and a nation to sincerely reflect and learn from our actions. This will enable us to rebuild the rich forest and coastal areas where people have lived for generations with peace of mind, and prevent such accidents from re-occurring during the next extreme disaster.

Table 2: Unique Aspects of the Fukushima Disaster

Socioeconomic effects of the nuclear accident and psychological aversion to radioactive contamination

- Increase and spread in anxiety among the victims, disaster areas, and surrounding areas.
- Unlike natural disasters, the risks (radiation exposure) continue and change.
- Radiation is invisible and odorless, and because people are unaware of the risk, the provision of information and communicative ability of responsible parties greatly affect the sense of trust and peace of mind of the public.
- People avoid disaster areas, which must fend for themselves because medical resources, such as people and materials, are lacking.
- The police, fire departments, and Self-Defense Forces intervene to assist in the rescue and transport of those with mobility challenges after the government’s order to evacuate. Their cooperation with medical professionals is a key.
- Medical and long-term care and facilities for those left within the evacuation zones becomes ghastly (causing unthinkable deaths).
- The ability of secondary medical facilities to simultaneously address both general disaster medicine and radiation exposure medicine is put to the test.
- Medical facility care must be widespread as large numbers of people are evacuated to distant locations (ultra-widespread care should be implemented from the start)

What has been brought to residents and communities by the nuclear power plant accident?
Special and serious disaster relief procedure modification
after the 2011 Tohoku earthquake and tsunami in Fukushima

Kazunobu Ishikawa

Abstract

After the catastrophic 2011 Tohoku earthquake and tsunami which struck cities and towns on the Japanese Pacific coast, Fukushima has been the focus of special and serious disaster relief procedures modification regarding nuclear power plant accidents. To date, the Japanese government has repeatedly issued evacuation orders to more than 100,000 residents. Huge numbers of refugees are still uncertain if they can return home and re-cultivate their farm land. Ambiguous public announcements concerning the radiation risks seem to have aggravated feelings of insecurity, fear and the desire to escape, both at home and abroad. This disaster has seriously undermined trust internationally and locally in Fukushima. Harmful rumors added further difficulties. In response to this disaster, local government, medical institutions, care facilities, police, emergency services and the Self-Defense Forces continue to put their utmost effort into reconstruction. This seismic disaster has reminded us that supplies of water, electricity, gas, gasoline and telephone/communication facilities are essential prerequisites for reconstruction and daily life. Disaster and radiation medical association teams actively participated in the rescue efforts, and a number of organized medical teams cared for about 15,000 refugees in 100 shelters. We also visited homebound patients, who were unable to evacuate from the 20-30km inner evacuation area. In this relief role, we need to consider the following; (1) professionals, both healthcare and nuclear engineers, must always be prepared for unexpected circumstances, (2) the daily organic cooperation of individuals and units is closely linked to readiness against sudden risks, and (3) appropriate accountability is essential to assuage the fears of residents and refugees. A sincere learning process may benefit those innocent refugees who may be forced to abandon their homes permanently.

Key words: *2011 Tohoku earthquake and tsunami, Fukushima, nuclear power plant accident, large-scale evacuation, professionalism*
(Nippon Ronen Igakkai Zasshi 2011;48:489-493)

Center for Medical Education and Career Development, Fukushima Medical University
Department of Cardiology, Fukushima Medical University Hospital

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Research: Depopulation with Rapid Aging in Minamisoma City after the Fukushima Daiichi Nuclear Power Plant Accident

Kazunobu Ishikawa, Yukio Kanazawa, Shigeto Morimoto, Takashi Takahashi

To the Editor: On March 11, 2011, a strong earthquake (magnitude 9.0) occurred off the Pacific coast and hit the northeast of Japan, followed by devastating tsunamis, which destroyed many coastal cities.[1,2] The three operating reactors at Fukushima Daiichi nuclear power plant shut down automatically just after this earthquake,[3] but 41 minutes later, a massive wall of rolling water burst through the plant's defenses and inundated the reactor buildings. The tsunami flooded emergency generators, leaving the plant without power for cooling systems while radioactive decay kept heating the cores. In the control room, plant workers desperately tried to run crucial instruments, using torches and car batteries scavenged from nearby vehicles, but the last line of emergency systems failed, and the three reactors melted down several days later. This process induced release of hydrogen gas, which caused explosions in the reactor buildings.

People in Fukushima mistrust the actions of the government and the Tokyo Electric Power Company because of poor provision of accurate information concerning the plant accident, even 1 year and 4 months after the disaster. Volatile radioactive chemicals including iodine-131 and cesium-137 started to spread into the air and sea. Investigation of radionuclide was conducted on bamboo sampled from six sites within a 25- to 980-km radius of the Fukushima plant in July to August 2011.[4] Strikingly high concentrations of radiocesium-134 and -137 activity were detected in mature leaves from Fukushima City (65 km from the Fukushima plant), in excess of 71 and 79 kBq/kg of dry weight (DW). In Kashiwa City (195 km from the plant), sample concentrations were in excess of 3.4 and 4.3 kBq/kg DW. In Toyohashi City (440 km from the plant), concentrations were below the measurable limits of up to 4.5 Bq/kg DW.

Last summer, a comprehensive public health study was established with a large budget at Fukushima Medical University.[3] This investigation was designed to follow up on thehealth of some 2 million people in the region for 30 years. According to the latest data (February 20, 2012), 99.3% of 9,747 people living in towns or villages close to the plant received an accumulated effective dose of less than 10 mSv during the first 4 months after the accident. The highest dose was 23 mSv, well below the acute exposure level (100 mSv) related to a slight increase in risk of malignant diseases. In Minamisoma, there were 305 disaster-associated deaths, 298 (97.7%) of which were in elderly adults.

Minamisoma Municipal General Hospital, which is located in the evacuation area 20 km from the plant, has served as a regional core institute for evacuees. Medical care providers have been performing health monitoring and medical care, including vaccination programs, for more than 4,000 victims.

In April 2012, the government released newly revised guidelines regarding the evacuation zones from the plant, but wide-area evacuation still continues in Fukushima. The population of 72,000 in Minamisoma before the accident decreased to approximately 10,000 just after the accident. On March 29, 2012, it had recovered to approximately 45,000. The proportion of those aged 65 and older increased from 25.9% to 32.1% (Figure 1A). In addition, the retention rate of population according to age group has dramatically changed (Figure 1B). Many younger than 40, especially infants, children, and young parents, moved out of the communities because of fear regarding radiation exposure, causing a rapid increase in the proportion of elderly people. In addition, loss of ordinary lifestyle may inhibit activities of daily living of older adults. Elderly adults dislike moving, and many continued to live there, suggesting the breakup of communities and families. The average age of the population in Minamisoma has increased by 14 years because of the nuclear disaster, with younger people leaving, whereas older people have stayed behind,

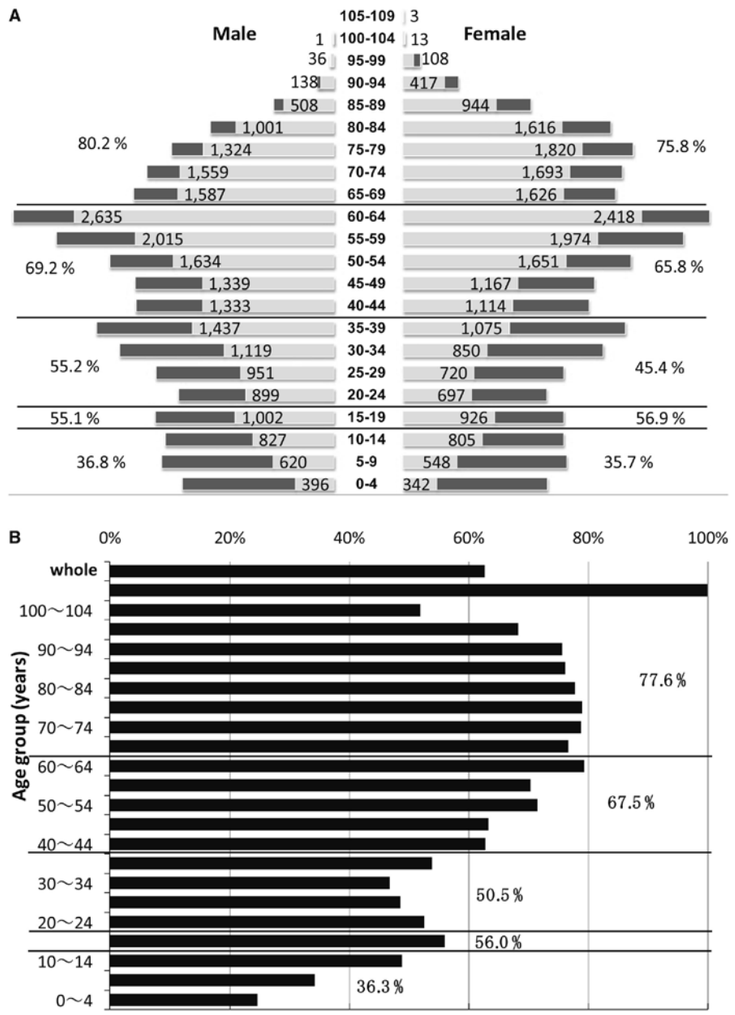

Figure 1. (A) Age-dependent decrease in population in Minamisoma City after the Great East Japan Earthquake and Fukushima Daiichi nuclear power plant accident. (B) Retention rate of population according to age group. Population data in Minamisoma on March 29, 2012 were compared with those on March 1, 2011.

reaching the level that it had been estimated it would reach by 2025. Similar events have been observed in Futaba County and Iitate Village near Minamisoma.

Public attention for the nuclear power plant workers[5] and people living in Fukushima is fading rapidly. We should continue to pay attention to depopulation with rapid aging, which may make rebuilding populations in stricken areas difficult.

Kazunobu Ishikawa, MD
Center for Medical Education and Career Development Fukushima Medical University, Fukushima, Japan and Department of Cardiology, Fukushima Medical University Hospital, Fukushima, Japan

Yukio Kanazawa, MD
Department of Gastrointestinal Medicine, Minamisoma Municipal General Hospital, Minamisoma, Japan

Shigeto Morimoto, MD
Department of Geriatric Medicine, Kanazawa Medical University, Kahoku-gun, Japan

Takashi Takahashi, MD
Laboratory of Infectious Diseases, Graduate School of Infection Control Sciences, Kitasato University Minato-ku, Japan

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The University Hospital Closest to the Fukushima Daiichi Nuclear Power Plant

The Struggle of a Hub Hospital in Treating the Victims of Radiation Exposure

Yumiko Nakajima, Vice president and Director of Nursing, Fukushima Medical University Hospital
Noriko Uezawa, Certified Nurse of Cancer Radiotherapy
Kanami Hashiguchi, Nurse, Department of Radiology, Nagasaki University
Second-Year Student (Masters Course) in the Certified Nurse Specialist Program in Radiotherapy, Graduate School of Biomedical Sciences, School of Health Sciences, Nagasaki University

The Fukushima Daiichi nuclear power plant accident was triggered by the Great East Japan Earthquake on March 11. The accident was beyond all our assumptions and its repercussions have not yet shown signs of dissipating. We thus cannot help but feel anxious about the on-going situation. Fukushima Medical University Hospital (hereafter FMU Hospital) is located closest to the scene of the accident and is a hub medical institution because it is the only university hospital within the prefecture. Nagasaki University and Hiroshima University have both provided advanced medical treatment to people exposed to radiation. Forming an alliance with these two universities, FMU Hospital attempts to tackle this unprecedented nuclear disaster. We would like to share the testimonies of nurses specializing in radiotherapy at Nagasaki University to show how our nursing department has been working on site.

Nagasaki University's Radiation Emergency Medical Assistance Team Rushes to Fukushima Immediately after the Accident

"Our biggest challenge was dealing with the delays in food and medical supplies, which were due to vicious rumors surrounding Fukushima at the time. However, even under such circumstances, Nagasaki University's Radiation Emergency Medical Team rushed into Fukushima to bravely work and provide medical assistance. This is the first thing I want everyone to know." Yumiko Nakajima, vice president and director of nursing at FMU Hospital, began our interview with this statement.

The impact of the earthquake on FMU Hospital was not very significant; there was little damage to its buildings. The hospital generally stockpiled food for patients in case of an emergency; however, the staff quickly realized that there was a serious shortage of food, especially for them. Student volunteers were kind enough to make some rice balls by mixing food they had brought from home; yet, they managed to provide each staff member with only two rice balls a day. Even after March 11, transportation routes were not entirely open, and it took about three or four day for food to be delivered to Fukushima. This was also caused by the harmful rumors that circulated about Fukushima, delaying the supply of goods into the prefecture.

Vice President Nakajima from the left, Uezawa nurse, Hashiguchi nurse (Nagasaki University)

Meanwhile, on March 13, Nagasaki University dispatched its Radiation Emergency Medical Assistance Team to Fukushima on the request of the Ministry of Education, Culture, Sports, Science and Technology. Nagasaki University has an impressive record in radiation exposure treatment and has experience in this field due to medical research and treatment of the 1986 Chernobyl accident victims. This medical specialist team comprised five members: one medical doctor, two nurses, one radiation technologist, and a professor in the field of radiation biology and radiation protection. The two nurses are both second-year master's students of the certified nurse specialist program in radiotherapy, which is offered only by Nagasaki University; both students are experienced medical practitioners.

The medical team collected information from the

National Institute of Radiological Sciences (NIRS) in Chiba and arrived in Fukushima by Self-Defense Force helicopters. When they went into Fukushima on March 14, they found the situation at the nuclear power plant progressively deteriorating. They first prepared for the secondary radiation screening of people with high levels of radiation exposure. With the passage of time, the situation at the site became worse. The media began to report that some power plant workers sustained injuries. At this time, the decision was made to establish the present system of screening and admitting patients. One of the nurses, a member of the Nagasaki University medical team, helped transport affected patients to the hospital by helicopter.

We interviewed Ms. Kanami Hashiguchi, who specializes in radiotherapy. Ms. Hashiguchi was part of one of the first group of nurses who came to Fukushima with the team. She continues to work on site at FMU.

Information Sharing with Radiation Emergency Medical Team (Twice a Day)

Soon after the disaster, FMU Hospital was in a state of chaos. The hospital had a decontamination ward and instruction manuals, and training for radiation decontamination was being annually conducted. Yet, after the accident, the decontamination ward was not properly utilized and medicines were not always available. The radiation medical ward, a center for treating patients exposed to radiation, was supposed to be fully stocked with requisite medical supplies. In addition, outpatient care and scheduled operations were suspended so that round-the-clock care could be provided to disaster-affected people. Even today, we are making triage decisions and providing treatment to victims with the support of Disaster Medical Assistance Teams (DMATs) dispatched across the country.

Under such circumstances, FMU Hospital organized a Radiation Emergency Medical Assistance Team immediately after the accident according to the instruction manual already in place. The team comprised more than a dozen specialists including a professor in the field of radiation as the team leader, emergency physicians, radiologists, radiation technologists, and nurses; some of the team members were from Nagasaki University and Hiroshima University. The team members now hold a meeting at 10 am every day.

Information is shared via online conferences held every day at 3 pm. The members include FMU Hospital, Offsite Center, Anti-Seismic Building of the Fukushima Daiichi nuclear power plant (Doctors were dispatched

(Left) Ms. Uezawa giving radiation emergency medical training
Nurses from the hospital listening attentively

from University of Occupational and Environmental Health), J Village Medical Center, NIRS, Hiroshima University, and Japanese Association of Acute Medicine. The sole purpose of these conferences was to share information on a daily basis about the status of injured or ill patients.

In late March, we were able to take this practice of information-sharing to the next level. After the daily meeting at 3 pm, members would meet with the Radiation Emergency Medical Assistant Team at 10 am the next morning to share information and discuss the medical approach taken. In mid-April, Ms. Uezawa, a nurse certified in cancer radiotherapy and who had recently finished her training program in June, joined our team as a full-time member.

As a radiotherapy specialist, Ms. Uezawa was knowledgeable about radiation exposure and radiation protection; however, her knowledge was somewhat limited because she had only participated in training sessions at NIRS. Nevertheless, she received the support of Ms. Hashiguchi and her colleagues from Nagasaki University, which she considered rewarding.

Preparing for the Prolonged Nuclear Accident by Implementing Frequent Simulations

Those who were taken to the hospital were in need of secondary or higher emergency care. As of the end of July, the number of radiation casualties was 11.

“Fortunately not many patients were transported to the hospital, but the situation at Fukushima nuclear power plant was real and volatile; we did not know the kind of issues patients would come in with. We are unsure of what may happen to these patients as time passes. Thus, we are now working hard with Ms. Hashiguchi from Nagasaki University and Ms. Uezawa at FMU Hospital to put a support system in place” (Vice President Nakajima).

The existing manual, drafted in 2002, only envisioned short-term medical care for a few casualties

Repeated simulation exercises help participants develop the skills required to engage in prompt and adequate patient transportation, decontamination, and other medical procedures. These exercises can contribute toward the creation of a new manual.
(Right) Ms. Hashiguchi from Nagasaki University videotaping the exercises for further assessment

like in the case of the Tokai village criticality accident. It certainly did not assume large-scale nuclear disasters such as this one. Therefore, we have tried to compile a new manual that includes all types of scenarios and simulation exercises that can be conducted repeatedly.

“We had never experienced such a nuclear accident in our lives, so there are still so many things we are not aware of. Therefore, it is important to conduct simulations and repeat them as many times as you need to be comfortable and confident in your actions. This is what simulation exercises do” (Ms. Hashiguchi).

“To prepare for a large-scale accident, we conduct routine training exercises as well as specific ones, such as patient transportation, decontamination, and other medical procedures. We videotape each training exercise, which are then brought back to the meetings to identify areas of improvement” (Ms. Uezawa).

At the radiation medical ward, we deployed nurses to respond to any situation 24 hours a day. The hospital also has two stand-by nurses who work in shifts, who also have to participate in simulation exercises. Ms. Hashiguchi conducted regular sessions to teach nurses how to use dosimeters and provide basic knowledge about radiation.

“The exercises allowed us to change our attitude toward radiation. It was no longer about the fear of dealing with radiation, but about focus. We now focus our energy on trying to prevent radiation from spreading. The frequent simulations with protective garments and gloves have made us more confident in dealing with any circumstance” (Ms. Uezawa).

If the after effects of a nuclear accident prolong, the number of staff members in the radiation medical ward will be reduced. Thus, it is important to build a system capable of operating without core staff members.

Ms. Hashiguchi will return to Nagasaki University at the end of July. She said, “I am satisfied with the environment where core members have their specialties and share knowledge with other staff. I am glad that we have come this far in such a short period.”

Vice President Nakajima, who is still pestered with queries emanating from the rumors about radiation, said “Providing correct information about radiation is the next step that our university hospital has to take. Some people evoke fears of radiation, making residents of Fukushima Prefecture excessively nervous.” Her concluding remark was “We are not certain about the future effects of the nuclear accident, but we are determined to remain involved in the health care of Fukushima residents.”

(At FMU Hospital, July 8, 2011)

Overview of Support Activities by Nagasaki University

Planning and Financial Affairs Division

1. Relationship with Fukushima Medical University (FMU)

(1) Establishment of a partnership agreement with the University (development of clinical research education programs, victim treatment, establishment of a research base for study of radiation effects, etc.) (4/2/2011)

(2) Expert Dispatch

- Appointment of Prof. Shun-ichi Yamashita as special instructor at the University (4/1/2011)
- Appointment of Prof. Shun-ichi Yamashita as Vice President of the University (7/15/2011)
- Appointment of Dr. Akira Otsuru, associate professor at Nagasaki University Hospital's Dr. Takashi Nagai Memorial International Hibakusha Medical Treatment Center, as an expert lecturer in victim treatment in the University's Radiation and Health Management Course, newly organized in October 2011.

(3) Support from the University's Radiation Emergency Medical Task Force

- Dispatched the Radiation Emergency Medical Task Force (comprising doctors, radiological physicists, radiation examination technicians, and nurses) to support the University's Radiation Emergency Medical Assistance Team (REMAT) from 3/15/2011. Established a secondary radiation medicine support team for triage medical support of the health of nuclear power plant workers and Self-Defense Force members. Performed victim health screenings of residents in disaster shelters.

(4) Student and Faculty Lecture Offerings

- Offered a lecture given by Dr. Shun-ichi Yamashita, Dr. Noboru Takamura, and Dr. Naoki Matsuda for the faculty titled "For the Safety and Security of Mothers and Children in the Wake of Today's Earthquake" (3/18/2011).
- Offered a lecture given by Dr. Takamura for all University faculties (4/4/2011).
- Offered a lecture titled "Interpretation and Decision-making from Radiation Measurements" given by Dr. Naoki Matsuda for the faculty (4/22/2011).
- Offered a lecture titled "Life with Radiation" given by Dr. Yamashita during the new student orientation (5/13/2011; two timeslots).

(5) Collaborative Medical Support Activities

- Participated in health examinations of in-home patients in Minamisoma confined to their homes due to the disaster (4/4/2011)

(6) Other Activities

- Held a press conference by Medical School Director Daito and Assistant Director Abe, as well as Dr. Yamashita regarding the withdrawal of newly admitted students due to the effects of anxiety caused by the nuclear incident and offered a message informing of no danger from radioactivity.

2. Activities throughout Fukushima Prefecture

(1) Radiation Emergency Medical Assistance Measures

- Dispatch of REMAT
  On 3/13/2011, the University dispatched REMAT (comprising doctors, radiation physicists, radiation examination technicians, and nurses), which began operations from 3/15/2011 using FMU as a base. It also established a secondary radiation medicine support team for triage medical support of the health of nuclear power plant workers and Self-Defense Force members and performed health screenings of residents in disaster shelters (2nd mention).
- Provision of relief supplies to support emergency radiation medical activities
  Provided Geiger counters, pocket dosimeters, stable iodine tablets, and other supplies shipped in by the University Faculty of Fisheries training ship "Nagasaki-Maru" (unloaded at Onahama Port).

(2) Spread awareness of radiation among residents.

- Appointed Dr. Shun-ichi Yamashita and Dr. Noboru Takamura as prefectural radiation health risk management advisors (3/19/2011). Since their appointment, they have held numerous instructional seminars for local residents and regional medical workers.

(3) Medical Support Activities

- With the support of the Governor of Fukushima, dispatched a medical team to Minamisoma (primary staff comprising a doctor, a dentist, and a nurse) primarily to perform in-house medical examinations of residents (for two months from 4/2/2011 to 5/30/2011).
- Nagasaki University independently dispatched its own medical team to disaster shelters in Minamisoma (comprising a doctor and an administrator, for a month from 6/2/2011 to 6/27/2011).

(4) Other Activities

- Autopsies and corpse identifications in Soma and Minamisoma performed by Nagasaki University Graduate School of Biomedical Sciences, Department of Forensic Pathology Associate Professor Dr. Kazuya Ikematsu at the request of the Fukushima Prefectural Police Department (3/15/2011–3/23/2011).
- Establishment of a partnership agreement with Fukushima University (development of education and research programs, restoration of contaminated areas, research collaboration and support for radiation medical treatment, promotion of increased literacy and awareness regarding radiation treatment, etc.) (7/28/2011).