2018

Journal of JART

—English edition—

2018

The Japan Association of Radiological Technologists

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Note: The contents of this magazine are those that have been published in JART magazine.

Overview of the Japan Association of Radiological Technologists

The Japan Association of Radiological Technologists, a public interest incorporated association under the jurisdiction of the Ministry of Health, Labour and Welfare, was established in 1947 with the purpose of contributing to the health of citizens through raising the professional ethics of members, improving and furthering the study of medical radiology and medical radiological technology, and enhancing public health.

In light of the startling progress being made in the fields of image diagnostics and radiation therapy where radiological technologists work, it is necessary to stay constantly aware of the latest know-how and technology. JART collaborates with other certification agencies to enhance the capacity of all radiological technologists in general through providing lifelong learning seminars, short courses, academic conferences and numerous other learning opportunities. We believe that such activities constitute our obligation as medical professionals to the general public.

As the only medical profession that has "radiological" in its name, we strive to limit medical exposure, to raise the standing of our profession, and to realize a profession of specialist technologists that can be advertised. And we are committed to promoting services with you all for the provision of safe and secure medical care.

general principles

We will render our services to those in need of health care.

We will act as individual members of a health care team.

We will perform our duties in our field of specialty.

We will continue to study for the benefit of mankind.

We will respect and practice the policy of informed consent.

Regarding Publication of the English Edition

Yasuo Nakazawa (President)

The journal of the Japan Association of Radiological Technologists (JART) has a monthly circulation of around 30,000 copies, and has been well received by our members and the public. The JART journal fulfils three major roles. First, in collaboration with the Japanese public and medical professionals, it publishes seminars on lifelong learning, thereby improving access to high-quality medical technology. Second, it publishes field-specific information on scientific technology and clinical radiology-related research papers written by JART members. Third, through the preface and introduction of the journal, it stimulates discussion on future possibilities for medical care in Japan, and on how clinical radiologists can contribute to the wellbeing of the nation.

To give our radiological technologists from across the globe an insight into our business, I will briefly explain the history of JART. In March 1896, we succeeded in taking the first X-ray image in Japan. In 1897, Shimadzu Corporation released an X-ray generator for educational use. In 1925, there were approximately 1,500 X-ray technicians. In 1927, the first Shimadzu X-ray Technician Training Institute was established, and evidence-based education was put in place. JART was founded in 1947 to make "radiological technologist" a national qualification. Since its establishment, we have worked towards broad acceptance of this national qualification, in collaboration with the government, the Diet, the Japanese Medical Association, and occupational military authorities.

As a result of our blood, sweat, and tears, in June 1951, we were finally able to see the promulgation of the Radiology X-ray Technicians Act, Act No. 226 of 1951. Since then, we have responded to the changing needs of the society, revising the original act to get the Radiology X-ray Technicians Act of 1968 passed, and partially revising that to get the Radiology Technicians Act and Radiology X-ray Technicians Act of 1983 passed, and finally getting the Radiology Technicians Act, which is in place currently, passed. Back then, the scope of work was limited to general X-ray testing, television X-ray testing, angiography, X-ray computed tomography scanning, RI scanning, and radiation therapy. In 1993, the Radiology Technicians Act was further revised, and MRI scanning, ultrasonic testing, and non-mydriatic fundus camera examination were added to the list. In 2010, image interpretation assistance, radiation examination explanation, and consultation work were added. In April 2015, intravenous contrast agent injection using automated contrast injectors, needle removal and hemostasis, lower digestive tract examination (anal catheter insertion and administration of contrast medium), anal catheter insertion, and oxygen inhalation during radiation therapy were further added as new operations that could be performed by radiological technologists.

JART will continue to respond to the needs of the medical industry, and we hope to broaden the operational scope of radiological technologists based on our foundation in scientific evidence. We will feature clinical, educational, and research-based achievements by radiological technologists in the monthly issues of the JART journal, and continually work to improve the magazine. I truly hope that this English edition will benefit radiological technicians worldwide.

History of The Japan Association of Radiological Technologists (JART)

1947
- Establishment of JART (July 13)

1951
- Promulgation of the Act on Medical Radiographers (June 11)
- Authorization for Establishment of the Japan Association of Radiographers (June 13)

1954
- First national examination for Medical Radiographers (May 30)

1956
- Event to commemorate the 10th anniversary of founding, attended by Her Imperial Highness Princess Chichibunomiya

1962
- Event to commemorate the 15th anniversary of founding and 10th anniversary of enactment of the Act on Medical Radiographers, attended by Her Imperial Highness Princess Chichibunomiya

1968
- Promulgation of the Act to Partially Revise the Act on Medical Radiographers (establishment of two professions) (May 23)
- First national examination for radiological technologists

1969
- Renaming as the JART
- Staging of the 4th International Society of Radiographers & Radiological Technologist (ISRRT) World Congress at Tokyo Palace Hotel, attended by Her Imperial Highness Princess Chichibunomiya

1975
- Event to commemorate the 80th anniversary of the discovery of X-rays, attended by Her Imperial Highness Princess Chichibunomiya

1979
- Completion of the Education Center for JART

1983
- Partial revision of the Act on Medical Radiographers and the Act on Radiological Technologists (unification of the professions)

1985
- Event to commemorate the 90th anniversary of the discovery of X-rays, attended by Her Imperial Highness Princess Chichibunomiya
- Staging of the 1st Japan Conference of Radiological Technologists

1987
- General assembly resolution for establishment of the New Education Center and a four-year university

1989
- Completion of the New Education Center (Suzuka City)

1991
- Opening of Suzuka University of Medical Science

1993
- The Act to Partially Revise the Act on Radiological Technologists, and Ministerial Ordinance to Partially Revise the Enforcement Orders (April 28)

1994
- Appointment of the President of JART as the 11th President of ISRRT

1995
- Event to commemorate the 100th anniversary of the discovery of X-ray, attended by Her Imperial Highness Prince Akishinomiya

1996
- Start of the Medical Imaging and Radiologic Systems Manager certification system

1998
- Staging of the 11th ISRRT World Congress at Makuhari

1999
- Start of the Radiation Safety Manager certification system

2000
- "Presentation of the Medical Exposure Guidelines (Reduction Targets)" for patients

2001
- Start of the Radiological Technologists Liability Insurance System

2003
- Enactment of X-Ray Week

2004
- Relocation of offices to the World Trade Center Building in Tokyo

2005
- Start of the Medical Imaging Information Administrator certification system

2006
- Staging of a joint academic conference between Japan, South Korea, and Taiwan
- Revision of the Medical Exposure Guidelines

2008
- Establishment of the committee on Autopsy imaging (Ai)

2009
- Revision to the national examination for radiological technologists
- Launch of the Team Medicine Promotion Conference, with the President of JART as its representative
- Appointment of the President of JART as chairperson of the Central Social Insurance Medical Council specialist committee

2010
- Health Policy Bureau Director's notification concerning promotion of team medicine

2011
- Support activities following the Great East Japan Earthquake
- Staging of an extraordinary general meeting concerning transition to a public interest incorporated association

2012
- Registration of transition to a public interest incorporated association (April 1)
- Event to mark the 65th anniversary of founding and transition to a public interest incorporated association (June 2)
- Renaming as public interest incorporated association JART
- Launch of the Radiological Technologists Liability Insurance System with participation by all members

2013
- Signing of the Comprehensive Mutual Cooperation Agreement on Prevention of Radiation Exposure (September 21)

2014
- Consignment of work to measure personal exposure of residents
- Revision of the Act on Radiological Technologists, Government Ordinance to Partially Revise the Enforcement Orders, and Revision of the Enforcement Regulations (June 25)
- Launch of the radiation exposure advisor certification system

2015
- Event to commemorate the 120th anniversary of the discovery of X-rays

2017
- Event to mark the 70th anniversary of founding and transition to a public interest incorporated association (June 2)

New Year Discussion Meeting:

Future importance of the Japan Association of Radiological Technologists (JART)

Introduction

Editor-in-Chief: We are grateful that you have all managed to take time out of your busy schedules to meet here today.

Today, at this New Year Discussion Meeting, I hope we will be able to discuss issues including the future for radiological technologists with the President and Vice-Presidents of JART from various perspectives.

Starting quickly, as I am sure you are all aware, a member of JART, Shogo Azemoto, ran for the House of Councilors election last year in 2016, but was unfortunately defeated. I think that JART members do not yet fully appreciate the need to include radiological technologists in the legislature. Accepting this situation, at this meeting, I would like the President of JART, Mr. Nakazawa, and Vice-Presidents Messrs. Sano and Kumashiro to discuss the "Future importance of JART" and to speak freely and include your opinions.

Why is There a Need for Radiological Technologists in the National Government?

Editor-in-Chief: Today, we first discuss why there is a need for radiological technologists in the national government. Your turn first, President Nakazawa.

Nakazawa, President: The national government has three roles.

The first role is making laws and enabling the national population to function in a fair and just manner to maintain and enhance national order. This is the law-making role.

The second major role is evaluating national development based on the allocation of the national budget derived from tax revenues. This is the budgeting role.

The third role is making agreements with people from various overseas countries. The best example is the TPP, although there are various international agreements for coexistence and co-prosperity. After these are signed, the clauses are ratified in Japan. This is the coexistence and co-prosperity role, involving coexistence and co-prosperity with other countries while negotiating agreements with them.

From the perspectives of the above three roles, three requirements emerge if we are to participate in the national government.

The first requirement is the national certification stipulated in the Personal Status Law. There are national certifications appropriate to all healthcare-related personnel. However, it might be necessary to revise the part of the Radiology Technicians Act relating to national certification to be in accordance with advances in national and healthcare development, as it is now 65 years since the Radiology Technicians Act was passed in June 1951. Therefore, in terms of needing to revise the Radiology Technicians Act to suit the current era, it seems that JART needs representatives in the national government.

The second point is that no progress in this occupational field can be achieved without progress in education and training. Therefore, while expanding our activities, we are tackling various types of lifetime education. The fundamental process takes place at four-year universities, or at present, at two-year and specialist colleges. However, it is first necessary to transform basic education to reliable, sound, four-year universities, and thus progress in a more appropriate to the current age. In addition, after graduation, people remain in the workplace for about 40 years, during which time lifetime education should play a highly important role. Various professional and academic associations are responsible for this education; therefore, JART, as a professional association, must handle the lifetime education of its members. To change the education system at colleges, the changes must be based on debate within the national govern-

ment, and from that perspective, it is necessary to participate in the national government.

The third point is the question as to what should be done to achieve further advances in team-based healthcare. As you are all aware, physicians, dentists, pharmacists, and nurses are currently actively employed in the Japanese Ministry of Health, Labour and Welfare (MHLW) and Ministry of Education, Culture, Sports, Science and Technology. These personnel are involved in the national government to some extent, where they employ their specialist backgrounds. Furthermore, decisions about the national budget are made with the involvement of these personnel in lifetime education to ensure they progress in their occupational areas. However, the government environment is currently such that unfortunately, budget decisions do not relate to occupations other than physicians, dentists, pharmacists, and nurses. Therefore, I consider that the MHLW must establish a team-based healthcare section for budget allocation consistent with the current situation. A team-based healthcare section should be established, and budget allocation for all healthcare personnel—not only physicians, dentists, pharmacists, and nurses—should be implemented within the MHLW. For this reason, I think it is essential that we participate in the national government.

From the above three perspectives, I conclude that it is necessary to participate in the national government.

Editor-in-Chief: President Nakazawa, thank you very much. What do the two Vice-Presidents think?

Sano, Vice-President: I agree with the President. From the viewpoint of healthcare quality, taking JART's mission to be a healthcare-related professional association, there is a requirement to achieve progress in healthcare and maintain the health of the Japanese public. From a global perspective, to maintain the level of healthcare alongside other occupational areas, we have a major responsibility to strive to improve knowledge and techniques as a specialist occupational area based on the fundamental stance of team-based healthcare, and to increase our own personal standards.

Therefore, we have many requests for and disputes about the national government. Of course, these overlap with the aspirations of other occupational areas. Furthermore, we are confronted with various areas where progress is not being made. As with other occupational areas, as a specialist occupational area, we are fulfilling our professional roles in the context of a certification-based society. In Japan, the

healthcare field has a rigid, quasi-feudal structure that has developed over its long history, and I therefore consider it essential for JART to have a platform so that its voice can reach the national government.

Editor-in-Chief: Thank you very much. What do you think, Vice-President Kumashiro?

Kumashiro, Vice-President: Yes, the principal aim of sending a representative to the national government is a definitive step in achieving appropriate policies. Taking as an analogy the Japan Nursing Federation, another professional association, the posting criteria for nurses were changed based on the policies it puts into practice. This may have been in 2006, but it had a huge impact, and yes, these are policies generated to focus on the safety of the public's healthcare. They were formulated by considering which method of posting nurses would provide safer healthcare. I think that unless the national government provides an arena for people who can talk accurately and knowledgeably about such policies, they will not be discussed within the legislature.

In addition, as a major reform, as part of the revision of the Public Health Nurses, Midwives, and Nurses Act in 2009, a nationally examined qualification and four-year university for nurses was legally stipulated, which had a major impact. To strengthen the practical achievement of policies, as the President said earlier, unless we send representatives to the national government and make appropriate laws, we will not be able to achieve a breakthrough.

Editor-in-Chief: Currently, the top page of the Japan Nursing Federation's website clearly states its involvement in politics. It includes text stating that it is essential that the national government include politicians who appeal for issues such as the better treatment of nurses. In addition, the Japanese Nursing Association submits documents to the MHLW stating its opinions on existing problems and how to address them. The Japan Nursing Federation clearly states, "This is not a task for us or other professional associations, but for politicians." We think that JART should refer to this.

Well, I think I have largely understood the positions of the three members of JART's Executive Committee—the President and two Vice-Presidents—and as President Nakazawa is the chief of the Executive Committee, I think that revising the laws has been an important activity to date. We also have great hopes in this regard. The President has thoroughly presented the current issues relating to the Radiology Technicians Act, but I would be grateful for a simpler explanation of these.

Problems with the Current Radiology Technicians Act and Items to be Revised

Nakazawa, President: As it was necessary to revise the Radiology Technicians Act, the Radiology Technicians Act Problems Assessment Committee explored the options over a period of one year from 2012. Following this, the findings were reported to the Board of Directors and public comments received. The

comments were collected and summarized in 2013.

Among the comments, Clause 2 of the Radiology Technicians Act defines the type of work to which this occupational area in the Act refers. However, although it previously referred to people whose jobs involved the application of radioactivity, application of the Medical Care Law after its revision on April 1, 2007 has resulted in the safe management of medical devices, which is also classified as a highly important activity. The findings of a long-term questionnaire-based survey carried out between 2009 and 2014 indicated that radiological technologists constitute approximately 20% of medical device safety managers. Therefore, radiological technologists include not only people involved with the application of radioactivity, but also those who reliably manage medical devices from the viewpoint of healthcare safety, involving safety management, maintenance spot-tests, and regular tests. Therefore, a revision of Clause 2 of the Radiology Technicians Act is essential.

In addition, as Vice-President Kumashiro commented previously, Clause 20 of the Radiology Technicians Act presents the qualification of candidacy for an examination. The four-year university graduation system, which is recognized by the Ministry of Education, Culture, Sports, Science and Technology and rated highly by the Japanese Nursing Association, is included in the qualification of candidacy for an examination. However, in our terms, most people have graduated from three-year universities. In this respect, in common with the Japanese Nursing Association, we should prioritize the four-year university system for qualification of candidacy for an examination. However, the three-year university system still exists, and it is therefore important to provide the qualification of candidacy for an examination with this system included. Clause 20 must be revised based on this assertion.

We now discuss the revision of Clause 24. This contains details about our performance of test procedures. However, I think various items are not included in government ordinances, although they should be included in the main clause, including magnetic resonance imaging, ultrasonography, and other test procedures. Regarding the revision of governmental and ministerial ordinances, one significant point is that inclusion in the main clause will make such revision very difficult, but change is feasible if included solely in the governmental or ministerial ordinances. Therefore, I think that this term does not relate to the test procedures in Clause 24, but that fundamentally, usable modalities should perhaps be included.

The next item is Clause 26. This has not been revised since 1951, but "definitive instructions" by physicians and dentists are included in the main text. As such, comprehensive instructions based on changes to those for physicians and dentists can be made, and comprehensive instructions for tasks relating to the series of medical devices included. Alternatively, comprehensive instructions about breast and gastric cancer tests can be provided for test facilities. Thus, the revision of Clause 26 should also enable efficient use of

our more specialized areas of activity from the viewpoint of the Japanese public.

The next item is Clause 28. The current version of this Clause states that regarding irradiation records, after the completion of tests and treatment, the physician or dentist must bring the test slip with him/her and sign it on-site. However, based on the current law, because of the issue of whether or not operations are carried out at the clinical institution and because an environment in which operations are impossible is established before they are carried out, changes are likely necessary. I think that after the completion of tests and treatment and/or before treatment, it will be necessary to clearly divide the site and proceed as such. In addition, currently, the storage term for irradiation records has not been stipulated. Therefore, I think that the storage duration should be specified as five years.

Related to the above, we are currently reporting anew about tasks relating to uncertainty inquiries, but making uncertainty inquiries relating to the instructions for physicians and dentists in all occupational areas. Radiological technologists are given different commands by orthopedic surgeons, for example, depending on whether the left or right knee is being treated, or by cardiovascular specialists depending on whether upper or lower abdominal computed tomography is being carried out. However, for the test request slips, if our medical staff make an expert judgment based on the test objectives, we may understand if the test objective is incorrect. If we then make an uncertainty inquiry and/or investigate the actual situation, even if the radiological technologist makes the uncertainty inquiry to a reliable physician in the requesting department, an incident/accident report is unfortunately sometimes not released.

For the above reason, unless the law clearly states that when there are uncertainties about tests requested by physicians or dentists, uncertainty inquiries must always be made, and

after confirming these, changes are made to the mode in which tests and treatment are carried out, major problems will occur from the viewpoint of healthcare safety. This is not an issue solely for radiological technologists, and I think that the duties of all healthcare personnel in relation to uncertainty inquiries must be stated in the law.

In addition, from the viewpoint of compliance, it is necessary to revise the law. For example, physicians, dentists, dental technicians, dental hygienists, nurses, midwives, and public health nurses must notify the prefectural government after being appointed in their fields. Alternatively, they may have the duty to notify the MHLW. I therefore think that we must also reliably provide such notifications, and that from the viewpoint of compliance, this must be changed in the law.

Editor-in-Chief: Thank you, President Nakazawa. Starting with Clause 2, in relation to proposals for the revision of several points, you explained the problems in a readily comprehensible manner. Now, do either of the Vice-Presidents have anything to add?

Kumashiro, Vice-President: Yes, that is so, is it not? The President just spoke about Claus-

es 24, 26, and 28. I am particularly concerned with Clause 26, namely "Definitive instructions," which I will interpret. Clause 2 simply states "in accordance with instructions" in relation to being in accordance with instructions by physicians or dentists. However, Clause 26 uses the word "definitive." I think that it should be considered that there are limits for which the interpretation is highly unclear or that this text is inconsistent and detached from the actual situation.

For the above reasons, in relation to the definitions in Clause 2, yes, as the President said, I think we must include items relating to actions such as uncertainty inquiries and healthcare safety. Currently, uncertainty inquiries are only mentioned in the Pharmacists Act, not in the Public Health Nurses, Midwives, and Nurses Act. Thus, I think it is essential to include statements relating to uncertainty inquiries covering various other occupational areas.

Editor-in-Chief: Thank you. What do you think, Vice-President Sano?

Sano, Vice-President: If the focus is on Clause 26, in the context of the current rapid aging of society, the main activities at healthcare sites are shifting from medical treatment to nursing care. In this context, I think that if in the future "Definitive instructions" is changed to "Comprehensive instructions," this will definitely constitute a key to expanding occupational tasks. In relation to nursing care, there is a potential for organizations that facilitate activities in a single mode as business entities, even without affiliation with medical institutions, such as home-visit nursing stations. Currently, we as radiological technologists cannot do this. Affiliation with medical institutions is needed, and there is a clear mismatch with the requirements of society. Even at the latest Gifu Scientific Meeting, personnel from MHLW participated in a discussion on these issues and their opinions were ascertained. Of course, clear, legally based responses were not obtained, but there are concerns that unless we obtain such responses in the future, the outcome will be a specialist occupational area incapable of responding to the demands of the public. In the current situation, in which the rush towards a highly aged society has continued for a considerable time, there are hopes for a legal framework that covers nursing care.

Nakazawa, President: That is indeed the case. In other words, home-visit nursing and radiological technologist stations are to be prepared for radiological technologists, who will visit nursing and welfare institutions based on the instructions for comprehensive liaison with medical institutions. First, the most frequent event is currently death due to aspiration pneumonia. Therefore, simple, frontal X-radiography and portable X-radiography of the chest are performed. In addition, deaths due to pulmonary occlusion caused by venous thromboembolism have occurred. Therefore, in tests using ultrasonography, radiological technologists can use ultrasonography in which X-rays are released. Furthermore, based on a system involving simple chest X-radiography, leg venous ultrasonography, and/or cervical ultrasonography, a system enabling comprehensive instructions will now be designed for us by Kuwayama (RT).

As pointed out by Vice-President Sano, this is not legally possible, and we will therefore now submit a request to the MHLW. The MHLW has personnel in the pipeline, so we will submit our request to these physicians. In addition, the law must be revised in relation to MHLW personnel, after which I think it will be necessary to achieve understanding by Dr. Yokokura, President of the Japan Medical Association and the rest of the association as stakeholders. Following this, radiological technologists, through thoracic simple X-ra-

diography and ultrasonography carried out at nursing institutions and welfare institutions, will need to establish an arena for activities capable of responding to the disease structure of an aging society.

However, the number of cases per institution is probably not great. Therefore, while senior radiological technologists are being effectively used, and liaising with each other and sharing work through half-day work, they will enroll in these stations, put healthcare into practice with a focus on the stations, and make progress while liaising with the Japan Medical Association. Kuwayama (RT) and a manufacturer are developing a plan for this type of system.

Kumashiro, Vice-President: In other words, this is a reorganization of tasks, right? Is this not the next new strategy, which is connected to support for image interpretation?

Editor-in-Chief: It is excellent, is it not? Regarding efficiently using seniors, senior physicians gradually age and the younger generation takes over. It seems the pie might be getting bigger, right? In this context, if there are new jobs, personnel can be assigned as appropriate. However, part-time pay for radiological technologists is now much lower than when I entered the field. If both the on-site requirements and efficient use of human resources are considered, I think this will be an excellent way of thinking from the perspective of JART.

Nakazawa, President: As we intend to consider this design in the business schedule for the period starting in April, we are currently having it prepared. I first want to verify the content of specific sections.

Sano, Vice-President: Another thought is that currently in legal terms, in the case of treatment institutions with patients who are bedridden and/or require special care, it appears that the rule is now that chest imaging must be carried out once per month. My impression is that in practice, this may not really be achieved reliably. Of course, there is a burden on bedridden patients solely due to being bedridden, but there also seems to be a burden on the party performing the imaging. However, the potential for future expansion of tasks targeting nursing care and including judgments about aspiration pneumonia and nosocomial infection by thoracic X-radiography, bedsores, and PDF (leg deep-vein thrombosis), and arteriosclerosis based on intimal-medial thickness have not been publicly discussed.

This institution is similar. Since about 20 years ago, when the rules were relaxed, general nurses have been paired with visiting nurses and staff have performed at-home imaging using portable equipment. As explained previously by President Nakazawa, places where activities at the senior level are conducted are expected to increase in future, and our dream is that at the same time, JART will include personnel who can rescue and provide support even during earthquake-related disasters.

Editor-in-Chief: Oh, I see. Turning to places

such as home-visit nursing stations, if for example, pneumonia is diagnosed with imaging. This is linked to support for imaging by reporting to a physician. Regarding infection, it is best that this takes place as soon as possible, and I feel that for our tasks, there is a single sequence of connections.

Considering the context of the "Definitive instructions" in Clause 26, President Nakazawa has spoken about radiological technologists' current on-site work. However, this is not based on definitive instructions, and therefore, computed tomography and so on can be carried out differently at different hospitals. In many cases, radiological technologists make judgments and then carry out imaging. They may perform additional imaging later; thus, the instructions in this regard are not definitive. This issue is under discussion even for on-site cases. Thank you very much.

Reconsidering the House of Councilors Election

Editor-in-Chief: We now largely accept that JART members must be sent to the national government, and that there are problems with the current Radiology Technicians Act. As for the actual approach JART should take in the future, the Japanese Association of Medical Technologists as well as physicians and nurses currently have Diet members. Despite the recent electoral failure, only JART can submit requests to the MHLW. The general members of JART understand this, and I think the importance of having Diet members is continuously increasing.

This means "reconsidering the House of Councilors election." However, in including this reconsideration, I would be grateful for comments from the President and Vice-Presidents, which do not have to be especially clear, on what the JART should do in the future and/or how representatives should be sent.

Nakazawa, President: The results of the 23rd and 24th House of Councilors elections were released on July 10. I think it is necessary to reconsider the activities during that three-year period.

Therefore, I recommend that the main body of JART's Political Federation and its branches in the 47 prefectures be consolidated as a single organization, and that Shogo Azemoto be advanced as energetically and forcefully as possible. Acknowledging our errors, one point to reconsider is that activities to urge people to vote were not implemented consistently as a single unit.

For the above reasons, preparations are already being made for the 25th House of Councilors election, which will take place in three years. In addition, based on the above reconsideration in relation to the Political Federation, places with no branches or only marginally active branches are encouraged to carry out branch activities more reliably. Furthermore, as the number of federation members remains at only around 550, it must increase to at least 10,000 to ensure an organization that enables vigorous efforts. We need to expand the organization, as appropriate activities cannot be achieved without at least 20 members in each prefecture and 1,000 members in total. Therefore, we need to implement activities to expand the organization.

Of course, there are issues about methods such as how to find candidates and with which organizations to liaise. For example, for the 24th House of Councilors election, JART held a conference entitled, "Supporting healthcare, nursing, and welfare in the 21st century" collaboratively with the Japan Dental Technologists Association, Japanese Paramedics Association, and Japan Association for Clinical Engineers. The strategy was planned at the conference. It is necessary to think carefully about that strategy and include the efforts and energy of the main section of the Political Federation. Therefore, yes, the number of members must increase. I think that this is the most important point.

Editor-in-Chief: Thank you very much. Is it unreasonable to think that when people join JART they should also join the Japan Federation of Radiological Technologists (JFRT)? Of course, that will cost more money. I hear that we will enter together with the Japanese Nursing Association, but can this somehow be effectively implemented?

Nakazawa, President: It is unacceptable to collect the money together. It is acceptable if there are separate application forms.

Some organizations used the same application forms, and it was difficult to distinguish them. This was previously pointed out by the Ministry of Internal Affairs and Communications, and is considered unacceptable.

Sano, Vice-President: Yes, I fully understand that at the intermediate level, the member level, the world of nursing had a need for a federation. This has been established based on a long history. I feel that a continuous flow has been achieved to some degree. Unfortunately, regarding JART, my perception is that the history until where that can be understood reasonably well is still insufficient. Our recent experience is that our efforts were clearly insufficient, and I think that radiological technologists will have to take this outcome to heart. Yes, as an organization relating to a specialist field that has accumulated a high level of goal consciousness over a long history, nurses have now fully accepted these requirements.

Editor-in-Chief: Yes, that is indeed the case. If you talk to numerous nurses, they say, "I will definitely join." However, I do not hear such enthusiasm about joining from radiological technologists, and the opinion that there is no sense of crisis is expressed even within the Executive Committee in Saitama Prefecture. Therefore, reconsidering issues at this discussion meeting with the President and Vice-Presidents, and looking at possible connections with future steps is one approach that should be shared with all JART members and for which something must be done.

Kumashiro, Vice-President: The selection of Shogo Azemoto as a candidate in the previous and most recent House of Councilors elections has increased awareness and recognition of JART among the public, and resulted in its major role. Therefore, I would like to express my respect for this. I think that the repeated challenges were truly difficult and required much effort. It is wonderful that the challenges were addressed. I think that this will continue to reflect well during Shogo Azemoto's life, and notwithstanding defeat, the campaign has generated a lot of networking that will be helpful in the future. However, one point to reconsider is that we did not have the organizational capacity to provide on that basis. Nine years ago, to support the candidate Mr. Nakanishi, the then President of the Japan Dental Technologists Federation, I rode in the election campaign car with him. As we drove around, we made a particular point of visiting all the workshops. As the strategy at that time, for example, I lived in Okayama prefecture, and our activism involved holding meetings

with powerful supporters in each of the five electoral districts in Okayama prefecture and collecting a register of names to increase the number of supporters. The history of dental technicians in terms of the Japan Dental Technologists Federation is long, and the history of the Japanese Nursing Association is even longer, so they have firmly established bases. I therefore gained a strong perception about controlling an arena in which the struggle takes place at the time of an election, regardless of who is elected as the candidate. We did not achieve that control. As the President said, I think the direction to take in the future should be presented to Shogo Azemoto.

Nakazawa, President: JFRT has not yet reached all JART members, and lectures centered on political lecture meetings will therefore in future be held collaboratively by JART and JFRT at eight places in Japan per year. In the North Kanto region, for example, a well-known lecturer will be invited to present, and there will be lectures at eight places per year. In this context, unless activities to increase the number of JFRT members are established, numerous people will remain unaware of the existence of JFRT. I therefore fully appreciate the necessity of the JFRT and for a drive to increase the number of JFRT members.

Editor-in-Chief: As to increasing the number of JFRT members from 550 to 10,000, I do not think that we will achieve this number, but I agree that it is difficult to campaign or have much effect with only 550 members. I also think the Executive Committee should be asked for their involvement. Thank you very much.

JFRT

Editor-in-Chief: The next theme in this meeting relates to the JFRT. The fundamental political activism involved in the process to date has been carried out by JFRT, while JART is the professional association. I think that all readers likely understand the difference, and regarding what should be done including additions, the President has just spoken a little about the number of members.

Nakazawa, President: The JFRT membership fee is currently ¥2,000 per person, so 10 members means ¥20,000 and 100 means ¥200,000. Therefore, a membership of 10,000 would generate ¥20 million for use to fund activism. As membership fees are used to fund activism, it seems that ¥20 million is needed. Various types of activism are essential; thus, 10,000 members are needed.

JART has approximately 28,500 members. Therefore, if 50% of these were to join JFRT, it would be possible to establish candidates from within our organization and campaign on that basis.

Kumashiro, Vice-President: Yes, these are appropriate figures. The Japanese Nursing Association has 700,000 members, and the Japan Nursing Federation has about a third of that number at 200,000. Therefore, the figure of 10,000 members the President proposed would be appropriate if JART had 30,000 members. If the same level of activism is to be achieved, it will be necessary for 10,000 people to work together.

Sano, Vice-President: The male/female ratio among JART members is currently 7:3, but the ratio among students at training colleges is now 5:5. In the future, the proportion of women may increase further. Regarding JFRT, I think that in the future, women may become of central importance. At present, an unexpected finding is that men are now unable to strongly influence their wives and family members. Female technologists, on the other hand, have the ability to strongly influence their husbands and thus obtain their votes,

meaning they are in a strategic position. In future, I think there is a need for various strategies including the Executive Committee increasing their involvement with younger people, making requests for cooperation to all an ex-colleague, and approaching female technologists. In addition, there are various ideas about ways to approach training colleges.

In future, regarding electoral campaigns, unless the organization is reestablished and fundamental changes made to a rigid system, the outcome will be the same. It is not possible that JART cannot do these things while other professional organizations can. If JART members are reasonably satisfied and do not have a sense of crisis, this must be affirmed, but it is certain that in the future people will indeed have a sense of crisis in relation to the expansion of tasks, employment positions, and qualifications. As such, the coming era presents grounds for anxiety. This means that technologists will be aware of the promotion of JART membership and the existence of JFRT, and in the context of the recent major electoral defeat, have an important place for membership in their consciousness. It is expected that an increasing number of technologists will understand these points. In future, our intention will be to continue to carry out energetic and reliable activities, but one important activity is that everyone gets together to discuss activism.

I think that the recent defeat must be converted to a major opportunity. Whether in three or six years, I look forward to a situation when for individuals who struggle successfully as candidates within the organization, all members are excited in terms of awareness of the situation and their keen voices will be heard inside and outside the organization. I will be grateful to everyone if such an outcome is ultimately achieved when I am appointed Campaign Manager.

Kumashiro, Vice-President: When I founded

the federation in Okayama Prefecture, several female technologists who worked at one-person workplaces unexpectedly joined. The number was not great, but I felt they represented a positive future. Perhaps they wished to maintain and protect the occupational field of radiological technology and do something about the present situation, so they joined and supported the federation. I thought they had a stronger tendency than male technologists and/or technologists at large facilities to think that the Executive Committee should be involved in activism. My impression is that the participation of female technologists has the potential to provide great strength.

Sano, Vice-President: Yes, I think so too. This is the general tendency in the world now, and if properly understood, a great energy and purity of heart is specific to women. I feel that men tend to have selfish and rambling thoughts and to be hair-splittingly logical, unlike women. Women often understand things intuitively without the need for reasoning, and I have great hopes for the future in this regard.

Editor-in-Chief: At JART, for various reasons such as supporting the return of women to the workplace, we think there may be items to include in the policies. Thank you very much.

Nakazawa, President: After establishing a human resources bank, progress is currently being made with a female human resources bank by Kuwayama (RT). Yes, in this area full use is made of women. Women take maternity leave, and some give up work after that, but it is important to create an environment in which this is not necessary and they can be employed with a work-sharing arrangement.

Although nearly 30% of JART members are now female, about 50% of new university graduates in this field are currently female. Therefore, I think it is necessary to change so that at least 30% of executives are female. To achieve this, JART has 25 directors, and 30% of that figure is about 7, although currently only 2 are female, meaning the number should increase by 5. As women are gradually appointed, the operations of JART will have to reflect a more female way of thinking.

Going through various regions, I looked around to determine excellent female technologists. In various places, I meet female leaders who may bear the burden of responsibility for the next generation in 10 or 20 years. There were excellent female directors even at the Gifu Scientific Meeting. I think that the people we want to be involved in activism in the future are currently not only at training colleges, but also in JART. In this context, I think it will be necessary to appoint an increasing number of women in the future.

Editor-in-Chief: Thank you very much. I also see that JART is made up of people. Yes, I think that people will support the organization, and am therefore hopeful about selecting the directors. Thank you very much.

Future Direction and the Need for Radiological Technologists

Regarding the direction and requirements of radiological technologists in the future, the President and Vice-President provided various opinions in the discussion. Among these, as the final summary, I would like to offer a heartfelt message to the leading professionals in JART that radiological technologists do think like that and will strive to put that way of thinking into practice.

Nakazawa, President: At the moment, I find it regrettable that these have not thoroughly spread, although a notification was released by the Director of the Pharmaceutical Affairs Bureau on April 30, 2010 and support for image interpretation, test explanations, and consultations initiated. Furthermore, JART also acted in concert, establishing an Image Interpretation Sub-Committee and holding various lecture meetings and evening seminars throughout Japan to support image interpretation.

I am reconsidering this, but a system for certification of technologists for image interpretation must be established and the instructions presented in scientific terms. However, in pioneering the certification of technologists for image interpretation, such as technologists with specialist certification for interpreting images of the head, neck, abdomen, or chest, JART must clearly define the curriculum. In relation to seminars and training courses alone, I am reconsidering the need for these to be together and diffused widely.

What will this field be like in five or ten years' time? The use of artificial intelligence (AI) for image interpretation has begun. Therefore, I think that an AI-based image interpretation support system will exist in the future. Our role as radiological technologists, in other words, image interpretation technologists certified for primary image interpretation, will be to check image interpretation supplementary reports generated by AI and provide them to physicians in the relevant clinical departments, namely cardiovascular specialists, brain surgeons, or emergency physicians.

In the field of diagnostic imaging, radiological technologists certified for image interpretation will check AI-supported reports generated by the AI diagnosis support system, and the results sent to physicians in the relevant clinical departments. I tend to think that this will be the operational flow followed in five or ten years' time.

For these reasons, during a transitional period, it will be necessary to establish a system for the certification of technologists for image interpretation, and in future to train such certified technologists by means of a master's degree course to produce technologists capable of such interpretation at universities. This system must be fully established within ten years. If not, I think it will be difficult to win society's trust.

The second point is that I think the radiotherapy field will continue to expand in future, and reliable quality control of radiotherapy will therefore be possible based on the appropriate operation of external radiation in the radiotherapy field. It seems necessary to establish a system of this type. Therefore, radiotherapy should become a full-time job, and technologists involved with radiotherapy must have technical competence achieved by training for six rather than four years.

Overall, I think that by including the fields of diagnostics and radiotherapy, all fundamental education probably requires a six-year course. If you do not want courses that long, an alternative approach would be for only technologists who carry out image interpretation in the diagnostic field and/or perform quality control of treatment to have master's degrees. Other technologists would have four-year degrees. Considering this, fundamental education will thus change to six years. I think this will be the reality over the next five to ten years.

Editor-in-Chief: Thank you very much. What do the Vice-Presidents think?

Sano, Vice-President: Regarding organizational reinforcement, the promotion of JART membership, and JART activism, I think that a publicity section for younger members will be needed to accurately transmit the opinions of the head division. We must again reconsider how best to express and transmit information to young technologists of the current generation; otherwise, it will merely look as though we executives are directing activities in a self-satisfied manner. In other words, I think we must strive to take an appropriate stance towards that happening without forgetting how this looks from the perspective of general JART members.

Next, we are currently energetically promoting human resources development seminars for young people centered in the Central Japan region. This spark has also lit up the Kansai region, and the number of active technologists including both young and core technologists has recently increased in Kansai. These groups remain small-scale with 20 to 30 participants, and no rapid spread is evident, but it is clear that the number of facility directors at various medical institutions who participate has started to increase.

Regardless of the meeting, that participants are JART members has been established as an essential requirement. I think that this steady and consistent activism and that of the JART

organization from several years ago are probably comprehensible from the viewpoint of young technologists and penetrate various workplaces. I cooperate from various viewpoints and provide back up. The outcome cannot be expressed concisely, but I believe that in five or ten years these personnel will form the backbones of their workplaces, their understanding and cooperation will enhance organizational capability, and the thus-activated workplaces will represent the fields in which professional associations will grow. I do my own bit with support from all sides. Thus far, the results are insufficient, but I believe that someday they will constitute a tide of change.

Editor-in-Chief: This is the time for sowing seeds, is it not?

Sano, Vice-President: Yes, on a previous occasion, in those terms, all the senior technologists came here. What were they discussing? The meeting was full. Therefore, although there are miscellaneous internal issues, for the issue of how to train and encourage young technologists interested in this area, rather than internally, senior technologists at each institution should meet, which will reinforce the organization.

Editor-in-Chief: Previously at JART, directors

were similar to managers, and organizationally, personnel made efforts at the regional level, which constituted the team of Vice-President Sano. Through this organization, opinions were communicated in various ways to various people, and it is perhaps advisable to consider a similar mechanism.

Kumashiro, Vice-President: In addition, the individuals making the most effort on a regional level were appointed as managers, but unfortunately, that was not achieved in organizational terms. For example, although there were three people in Okayama Prefecture, other regions did not even have one person. The allocation was not consistent between the 47 prefectures. These are distributed consistently throughout Japan; however, the current Executive Committee established the current system of Educational Committee members. There are Educational Committee members in all 47 prefectures, and Educational Committee managers who represent these regions are positioned there. The eight managers in eight regions and Educational Committee members in 47 prefectures are organized systematically. Therefore, I think they now function effectively.

Editor-in-Chief: I see. Therefore, they are Educational Committee members.

Kumashiro, Vice-President: Yes, that is correct. The current Educational Committee members are responsible for that, are they not?

Nakazawa, President: Was it not previously the managers? Now it is members of the Educational Committee.

Sano, Vice-President: It might be difficult to achieve absolute consistency across Japan, but we are hoping for improvements.

Kumashiro, Vice-President: Among the opin-

ions of the future conceptions of the President and Vice-President Sano, as Vice-President Mr. Sano commented, I agree that to become active in various regions it is essential that the relevant persons understand and cooperate with our activism. I do not think our operations can be established without cooperation between all 47 prefectures.

The records of the interview on image interpretation support were passed to the Editor-in-Chief the other day. However, I am working with the Chairperson and responsible directors for Okayama Prefecture in this respect. A consultation has been held between physicians in the Healthcare Coordination Section of Okayama Prefectural Health and Welfare Dept., which is responsible for directing and supervising healthcare, and welfare-oriented businesses within the prefecture and executives of the Okayama Prefectural Association of Radiological Technologists. The theme of the consultation was "Support for image interpretation by radiological technologists." The status of this consultation between the two parties was published in *Osera*, an information agency magazine widely read in Okayama Prefecture. *Osera* has readers from a range of occupations within the prefecture, from corporate managers to full-time housewives, and seemed to have major results in terms of wide publicity among prefectural citizens. I think that another important outcome is that support for image interpretation by radiological technologists, and thus contribution to healthcare safety, is currently widely known within the prefecture. For attempts of this type, I think it is necessary for JART to actively cooperate with the prefectural associations.

Next, regarding the system for the certification of technologists to support image interpretation, as presented by the President, we think there is a need for certification of the image interpretation support hoped for by all physicians including radiologists. Even if the workplace includes technologists with reliable image interpretation capability, currently, no-one can evaluate and provide quality assurance for that interpretation. In terms of workplace units, this should not be the role of the senior technologist, a radiologist, or the hospital director. I strongly contend that on an official level, if it is necessary for the institution director to provide certification at the workplace-unit level for technologists who have been reliably certified by a third party, it will be practical for image interpretation support to be provided within the workplace.

Nakazawa, President: Yes, a technologist certification system trusted by the population is a necessity. Therefore, considering the specialist occupational field of radiological technologists, it is necessary to involve physicians in the Japan Radiological Society and mutually establish the system. When the Director of the Pharmaceutical Affairs Bureau released a notification about image interpretation support on April 30, 2010, a discussion was requested with the President of the Japan Radiological Society on how to establish a certification framework. However, this was unfortunately canceled.

Editor-in-Chief: Thank you, President and Vice-Presidents, for telling us about the future direction of progress and the aspects needed.

I was surprised to hear the term "AI" used by the President. In Japan, as in other countries, progress with AI is part of national policy, and although my understanding was accurate in terms of AI for image interpretation not yet having spread much in Japan, this may in future be explosively fast. Therefore, appropriate preparation is needed.

Nakazawa, President: With the initiation of diagnostic imaging big data collection from the public, will this not be difficult? Therefore, depending on the degree to which AI image in-

terpretation report precision can be increased, neither radiological technologists nor diagnostic imaging specialists in the Japan Radiological Society can remain unfettered by this area. Thus, I think a sense of crisis is essential.

Closing Remarks

Editor-in-Chief: Thank you very much. I would like to ask President Nakazawa to say a few words to close this discussion meeting.

As this is a New Year Discussion Meeting, I will be grateful if you would present your message to JART members on your feelings about this year.

Nakazawa, President: It is an important slogan for JART that it aims to coordinate team-based healthcare with the Japanese public. I therefore think that healthcare professionals including ourselves as radiological technologists must at all times be aware of the need to ascertain from the public what they desire from healthcare professionals.

In our opinion, it seems that the public hope for the provision of safe, reliable, and high-quality healthcare. Therefore, we have provided scientific support to guarantee safety. It is essential to use evidence-based tests and treatment with reference to data and published documents. In this context, I think it is important to determine the demands of the public, and then in terms of our specialty, to increase quality in our occupational field. During 2017, together with the public, I would like to be able to achieve progress in healthcare. I also hope we will have mutual recognition in this regard. With this, I would like to conclude my comments.

Editor-in-Chief: Thank you very much. With that, I would like to close this discussion meeting.

The 21st Asia-Australasia Conference of Radiological Technologists

President's speech

Radiation Protection and Monitoring in Japan

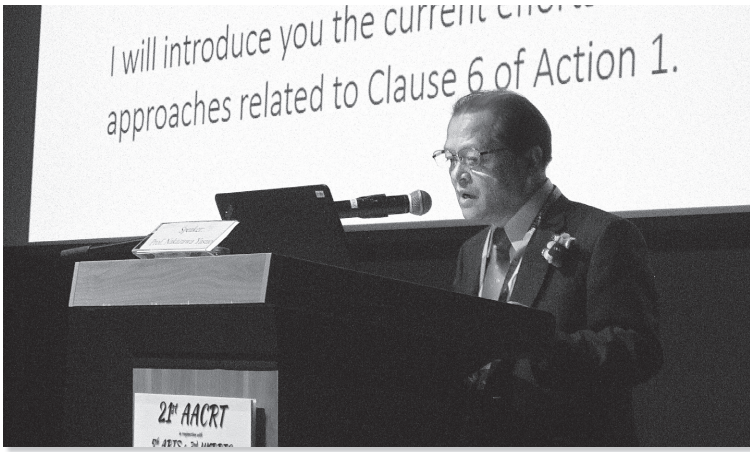
Yasuo Nakazawa
President, The Japan Association of Radiological Technologists

The 21st Asia-Australasia Conference of Radiological Technologists (AACRT) in conjunction with 5th Asia Radiotherapy Symposium (ARS) and 3rd Hong Kong Radiographers and Radiation Therapists Conference (HKRRTC) at Hong Kong Science Park, from 23-25 June 2017.

I am Yasuo Nakazawa, President the Japan Association of Radiological Technologists.

Today, I would like to make a presentation, entitled "Radiation Protection and Monitoring in Japan".

First of all, I'd like to introduce the present report in Japan and our activities as the Japan Association of Radiological Technologists, especially high-colored 4 items out of 10 items in BONN CALL FOR ACTION (Table 1).



IAEA・WHO
BONN CALL FOR ACTION（2012.12）
10 Actions to Improve Radiation Protection in Medicine in the Next Decade

1. Enhance the implementation of the principle of justification
2. Enhance the implementation of the principle of optimization of protection and safety
3. Strengthen manufacturers' role in contributing to the overall safety regime
4. Strengthen radiation protection education and training of health professionals
5. Shape and promote a strategic research agenda for radiation protection in medicine
6. Increase availability of improved global information on medical exposures and occupational exposures in medicine
7. Improve prevention of medical radiation incidents and accidents
8. Strengthen radiation safety culture in health care
9. Foster an improved radiation benefit-risk-dialogue
10. Strengthen the implementation of safety requirements globally

Table 1

(Action 1)

Enhance the implementation of the principle of justification

Question. Is there any example of principle of justification of request for examination?

Answer. In Japan, there is no principle of justification of request for examination.

We have no choice but to entrust judgement of the attending physicians.

(Action 1-6)

Next, I will talk about additional criteria to the justification of medical imaging diagnosis for patients without the symptom.

Further develop criteria for justification of health screening programmes for asymptomatic populations (e.g. mammography screening) and for medical imaging of asymptomatic individuals who are not participating in approved health screening programmes (e.g. use of CT for individual health surveillance).

I will introduce you the current efforts in Japan and approaches related to Clause 6 of Action 1.

Current trends of breast cancer screening in Japan (Fig.1).

More than 80,000 people suffer from breast cancer (including carcinoma) a year (National estimates based on regional cancer registries, 2011).

At least 13,000 patients die due to breast cancer (Vital statistics, 2013).

Proposal for clinical parameters of breast cancer screening (Table 2).

We compare the past and present parameters in this table.

Proposal for clinical parameters of breast cancer screening

1987～	2000～	2004～
1）Screening method ・an interview ・visual inspection and palpation	1）Screening method ・visual inspection and palpation ・Screening mammography	1）Screening method ・Screening mammography ・Ultrasonography may be introduced in the future.
2）qualifying age ・30 years old or older	2）qualifying age ・50 years old or older	2）qualifying age ・40 years old or older
3）inspection frequency ・Once a year	3）inspection frequency ・Once every two years	3）inspection frequency ・Once every two years

Table 2

Current issues of breast cancer screening (Fig.2).

There is no legal regulation for the quality control of breast cancer screening.

The percentage of people who get cancer screening in Japan is extremely low with 30-40%, while it is 70-80% in the OECD (the Organization for Economic Cooperation and Development) participation countries.

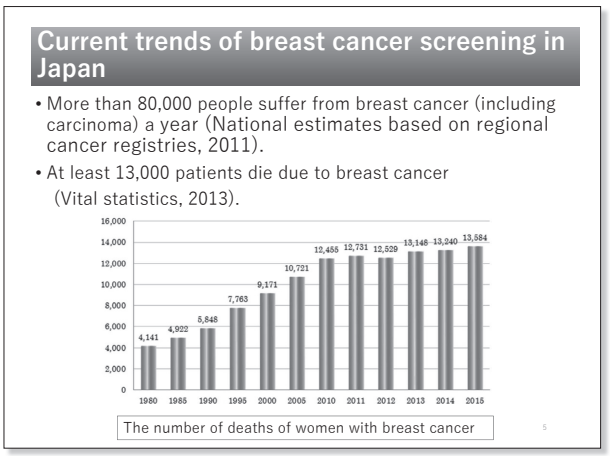


Fig.1

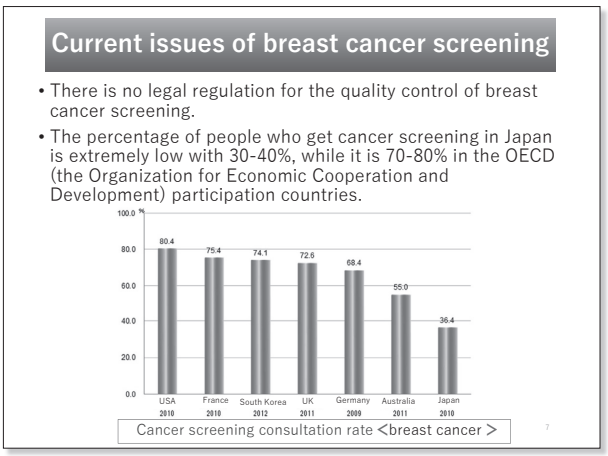


Fig.2

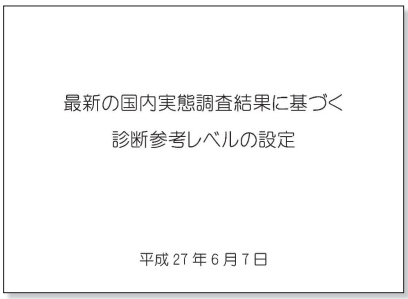
(Action 2)

Enhance the implementation of the principle of optimization of protection and safety

Question. Is there any local, regional or country level Diagnostic Reference Level setup in your country?

Answer. Yes.

Japan Network for Research and Information on Medical Exposure (J-RIME), which consists of societies, administrations, and industries related to Medical exposure, published "Diagnostic Reference Levels Based on Latest Surveys in Japan —Japan DRLs 2015—" for the first time in Japan.



Diagnostic Reference Levels Based on Latest Surveys in Japan —Japan DRLs 2015—

J-RIME consists of the Japan Association of Radiological Technologists and many other societies, administrations, and industries related to Medical exposure, including those shown in this slide (Fig.3).

Background of Diagnostic Reference Levels Based on Latest Surveys (DRLs 2015).

Since global interest in medical radiation exposure has increased, each country has set the diagnosis reference levels for radiation protection in medical care. However, diagnosis reference levels were not established until recently in Japan.

In Japan, national interest in medical radiation exposure has increased after the Fukushima Daiichi nuclear disaster in the Great East Japan Earthquake despite of the fact that it posses the largest number of CTs in the world. Thus, development of diagnostic reference level was demanded.

DRLs 2015 is the first diagnostic reference level in Japan which was set via cooperation among societies, administrations, and related groups.

Recently published DRLs 2015 includes the Diagnostic Reference Levels for the following 7 items:

Medical X-ray imaging and Computed Tomography (CT), Adult CT scans, Childhood CT scans, General CT scans, Mammography, Intraoral radiography, IVR, and Nuclear Medicine.

About the contents of the diagnosis reference level for adult CT, please see this table (Table 3).

Fig.3

About the contents of the diagnosis reference level for adult CT

	$CTDI_{vol}$ (mGy)	DLP (mGy・cm)
Head CT scan without contrast	85	1350
Single-phase Chest CT	15	550
Single-phase Chest-Pelvis CT	18	1300
Single-phase Upper Abdomen-Pelvis CT	20	1000
Liver dynamics	15	1800
Coronary arteries	90	1400

Note 1. Standard body weight: 50-60 kg ("Coronary arteries" case: 50-70 kg)
Note 2. "Liver dynamics" did not include "Chest-Pelvis".

Table 3

About the contents of the diagnosis reference level for childhood CT scans, please see this table (Table 4).

About the contents of the diagnosis reference level for childhood CT scans

	Less than 1 yo		1-5 yo		6-10 yo	
	$CTDI_{vol}$	DLP	$CTDI_{vol}$	DLP	$CTDI_{vol}$	DLP
Head	38	500	47	660	60	850
Chest	11 (5.5)	210 (105)	14 (7)	300 (150)	15 (7.5)	410 (205)
Abdomen	11 (5.5)	220 (110)	16 (8)	400 (200)	17 (8.5)	530 (265)

Note 1. Values for a 16 cm phantom are shown. Values for 32 cm are shown in parentheses.
Note 2. The units for $CTDI_{vol}$ and DLP are mGy and mGy/cm, respectively.

13

Table 4

(Action 4)

Strengthen radiation protection education and training of health professionals

Question. How are radiographers in your country trained for radiation protection?

Answer. According to Japanese law known as the "Act on Prevention of Radiation Hazards due to Radioisotopes", Medical and research institutions which have obtained the permission from Japanese government are required to receive annual education training once a year.

The other institutions perform education training independently.

(Action 4-1)

I will show you the actual situation about Action 4-1.

Prioritize radiation protection education and training for health professionals globally, targeting professionals using radiation in all medical and dental areas;

Radiation-related medical education contents in Japan (2016) include: (Fig.4)

(Action 4-1)

Prioritize radiation protection education and training for health professionals globally, targeting professionals using radiation in all medical and dental areas;

Radiation-related medical education contents in Japan (2016) include:

- Effect of radiation on the human body and radiation hazard,
- Human body and radiation,
- Medical radiation and effect of radiation on the human body,
- Radiation risk communication, and
- Radiation hazard medical care.

15

Fig.4

(Action 10)

Strengthen the implementation of safety requirements globally

I'm showing about Action 10.

Question. How are patients protected by regulations in your country?

Answer. There is no regulation on the radiation for protecting patients.

Thus, we'd like to introduce the efforts of the Japan Association of Radiological Technologists for Action 10.

These are the activities of The Japan Association of Radiological Technologists for Action 10.

Authorization of the radiation managers, 1,735 persons.

Advisors on radiation health risk control, 200 persons.

Accreditation of institutions which reduce radiation exposure, 72 institutions.

Certification system of facilities optimizing medical exposure dose

- Purpose for certification system
- Progress
- Inspection items
- Certificate and plate
- certified facilities

Purpose of the certification system.

The responsibility for optimizing medical exposure dose naturally falls to RT, who, by doing so, gain greater trust as specialists. Gaining the public's trust in radiological examination requires a variety of measures, such as technological support for maintaining and improving the quality of radiological examination for determining appropriate examinations; optimization of exposure factors for examination purposes; quality control of radiologic equipment; and appropriate explanations to alleviate patients' anxiety regarding examination.

By certifying and releasing the names of medical facilities which have demonstrated that they satisfactorily perform the above measures, the JART can ease the public's fears regarding radiological examination.

Progress

The founding of this system

The trial period: 2 years from 2005.

The full scale work started from 2007 until now.

We revised the inspection items partially last year.

We revised the guideline for medical exposure dose based on the Japan DRLs 2015.

Therefore we have inspected with this guideline from this year.

Inspection items

These items are divided into "justification of actions" and "optimization of protection"; for the latter, inspections are conducted for each modality.

Inspection scale:

A: high level
B: standard level
C: sub-standard level
NA: not applicable

Certificate and plate

This is a certificate and an authorized plate issued from the Japan Association of Radiological Technologists (Fig.5).

Fig.5

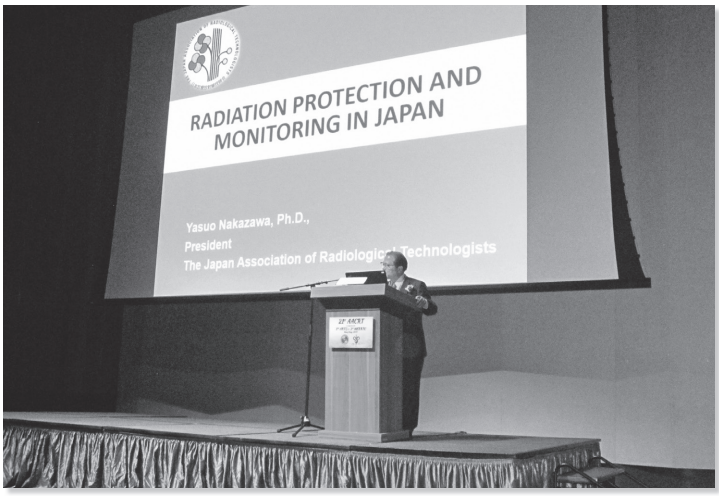
certified facilities

There are 72 certified facilities in Japan, please see this table (Table 5).

Prefecture	Facilities		
Hokkaido	3	Mie	0
Aomori	0	Shiga	0
Iwate	0	Kyoto	1
Akita	1	Nara	0
Miyagi	0	Wakayama	0
Yamagata	0	Osaka	3
Fukushima	1	Hyogo	2
Niigata	0	Okayama	2
Tochigi	1	Hiroshima	1
Ibaraki	1	Tottori	0
Gunma	0	Shimane	0
Saitama	8	Yamaguchi	1
Chiba	4	Tokushima	0
Tokyo	6	Kagawa	0
Kanagawa	5	Ehime	0
Yamanashi	1	Kochi	0
Nagano	3	Fukuoka	4
Ishikawa	1	Saga	0
Toyama	0	Nagasaki	1
Fukui	1	Oita	1
Shizuoka	4	Kumamoto	3
Aichi	10	Miyazaki	1
Gifu	1	Kagoshima	1
		Okinawa	0
		合計	72

Table 5

Thank you for your attention.



Toward revision of the designation regulations for radiological technologist training schools

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Key words: radiological technologists, training school for radiological technologists, designation regulations, medical safety, team medical care, expanding duties, national exam

【Abstract】
The designation regulations for radiological technologist (RT) training schools were revised in 2000, more than 15 years ago. In that time, medical care has become more advanced and diverse, which has both expanded and complicated the duties of RTs. The levels of skill and ability expected of RTs have increased and changed with the times. A notice (Health Policy Bureau 0220.2) issued by the Japanese Ministry of Health, Labour and Welfare on February 20, 2015, sought to revise the content of, and number of credits in, RT education to accompany this expansion in duties, increasing the number of credits from 93 to 95. However, a 2-credit increase in education does not reflect the duties RTs perform, or the skills and abilities that are required of them. Further additions and changes are needed. This report describes the initiatives undertaken by the Japanese Association of Radiological Technologists to revise the designation regulations for RT training schools.

1. Introduction

The curriculum for training schools for radiological technologists (RTs) was reviewed in 2000,[1)] and on March 30, 2001, the designation regulations for RT schools were revised. In the 15 years that have passed since these changes were made, medical care has become more advanced and diverse, which has both expanded and complicated the duties of RTs. The levels of skill and ability expected of RTs have increased and changed with the times.

Meanwhile, in the interest of guaranteeing medical safety and promoting team medical care, a Health Policy Bureau notice (0430.1) dated April 30, 2010, on "Promoting team medical care through cooperation and collaboration between medical staff" stated that the duties of an RT included assisting with interpretation in diagnostic imaging, and explaining and consulting on radiological examinations and other matters.[2)] In addition, a Health Policy Bureau notice (0220.2) dated February 20, 2015, on "Revision of designation regulations for RT schools" that accompanied a partial revision of the Medical Radiology Technician Law sought to revise the content of, and number of credits in, RT education to accompany this expansion in duties, increasing the number of credits from 93 to 95.[3)] However, a 2-credit increase in education does not adequately reflect the duties RTs perform, or the skills and abilities that are required of them. Further additions and changes are needed.

This report describes the initiatives undertaken by the Japanese Association of Radiological Technologists (JART) to revise the designation regulations for RT training schools.

2. Motive

On July 25, 2014, JART sent the chiefs of the Ministry of Health, Labour and Welfare's Health Policy Bureau and the Ministry of Education, Culture, Sports, Science and Technology's Higher Education Bureau a request to form a committee to study how clinical training should be carried out in the education of RTs.[4] This request was prompted by an alleged violation of the Medical Radiology Technician Law that occurred at a clinic in the city of Kobe on November 7, 2013. In this incident, an associate nurse and office worker without RT qualifications allegedly performed X-ray imaging. The Hyogo Prefectural Police arrested the Clinical Director, an associate nurse in her 60s, and an office worker in her 40s on suspicion of violating the Medical Radiology Technician Law. The Clinic Director allegedly ordered the associate nurse, office worker, and others to conduct computed tomography (CT) scans and X-ray examinations on patients on multiple occasions. In response to this incident, the Hyogo Prefectural Police issued the following directive to the Japanese Medical Imaging and Radiological Systems Industries Association (JIRA).

Previously, arrests were made by the Hyogo Police over suspected violations of the Medical Radiology Technician Law at a clinic in Kobe. A doctor is suspected of regularly ordering nurses, nursing assistants, and other staff to perform X-ray imaging and CT scans. The nurses and other staff allegedly prepared the X-ray and CT equipment for imaging (settings), then called the doctor, who pushed the irradiation button without checking the settings. In addition, when the Hyogo Police questioned the vendor that supplied the clinic with X-ray and CT equipment, they were under the mistaken impression that it was not illegal for nurses or other staff to prepare the machines, then have a doctor push the irradiation button. In consideration of these circumstances, the Hyogo Police requested that JIRA notify the medical device companies in its membership of the following directive, which is intended to eliminate any mistaken understanding.[5]

Directive

It is a violation of the Medical Radiology Technician Law for nurses or other staff to carry out preparations for X-ray or CT imaging (settings), then have a doctor push the irradiation button without performing a careful check.

When inquiries are received from medical institutions and elsewhere, they should be told that equipment can only be operated by doctors, dentists, and other legally qualified professionals.

Moreover, the following exchange concerning clinical training for noninvasive examinations (ultrasound etc.) occurred at a meeting of Committee of training institution for Radiological Technologist in Hokkaido on June 20, 2014. An official from the Ministry of Health, Labour and Welfare was asked, "During clinical training, is there a problem with students being the examinees so they can experience noninvasive examinations, or with students practicing these tests on each other at a school?" The official responded, "Provision 24.2 of the Medical Radiology Technician Law [In assisting with medical care, MRI and other duties can be performed under the direction of a doctor or dentist.] does not allow a person who does not have a license to perform these acts. Performing these acts using such devices can be considered assisting with medical care." The official added, "Legally, can this be done? In principle, no. However, a 2003 report by the Japanese Nursing Association contained the interpretation that, under certain conditions, it would be legally justified for students to assist with nursing as part of clinical training. As for students performing

MRI or other exams on each other, there are questions as to its legal justification and what students should be allowed to do for educational purposes, so I cannot, at this time, say whether it would be illegal or not. That said, if it is done without any rules in place, I think that would be illegal."

This suggests that, in the education of RTs, having students perform noninvasive ultrasound examinations for training purposes, to say nothing of acts like using patients as part of clinical training, could be in violation of provisions 2.2 and 24 of the Medical Radiology Technician Law because students do not have national certification. If the objective of having students undergo clinical training with real patients cannot be fulfilled, it could lower the standard of education, and reduce the quality of future RTs. Therefore, JART sent a request (No. 388) dated July 25, 2014, that a committee be established to study how clinical training should be carried out in the education of RTs.[4)]

3. Process of compiling "Report from the committee on statutes and clinical training of RTs"

Table 1 shows the process JART went through to compile the "Report from the committee on statutes and clinical training of RTs."

To raise the quality of RT and increase the standard of education, we believe the Ministry of Health, Labour and Welfare and Ministry of Education, Culture, Sports, Science and Technology need to create a committee to stipulate standards regarding which basic acts can be performed under certain conditions as part of the clinical training RT schools are entrusted with, the same as is done for doctors, dentists, nurses, and other professions. In response to this request, the Ministry of Health, Labour and Welfare decided it needed to understand the state of clinical training in more detail, so it conducted a survey to determine whether a committee should be established to study clinical training in the education of RTs. The survey was conducted over about 2 weeks, starting on January 19, 2015. The survey was sent to 46 RT schools and 41 responded, a response rate of 89.1 percent. The results showed that a variety of requests were made of medical facilities regarding the clinical training of RTs, and that there was a great deal of variation between schools. Further, most schools, 85 percent, said they wanted standards on the medical acts that are permitted under certain conditions during clinical training. Schools also desired criteria for certifying clinical trainers.

Based on the results of the survey, it was concluded that, to raise the quality of RTs and increase the standard of education, the Ministry of Health, Labour and Welfare and Ministry of Education, Culture, Sports, Science and Technology should create a committee to stipulate standards regarding which basic acts can be performed under certain conditions as part of the clinical training permitted in RT schools, the same as is done for doctors, dentists, nurses, and other professions. Therefore, based on the results of the fact-finding survey on clinical training at RT schools, JART, again, sent a request (No. 287) dated April 20, 2015, that a committee be established to discuss how clinical training should be carried out as part of the education of RTs.[6)] On May 27, 2015, JART provided the Ministry of Health, Labour and Welfare with further clarification of this request. At this meeting, the ministry advised JART that, because some of the designation regulations for RT schools covering clinical training, the designation regulations overall would need to be revised. Thus, it would be helpful to have a venue to discuss the matter with the schools.

Taking this advice, JART sent a proposal (No. 364) dated June 1, 2015, to the National Council of RT Training Institutes regarding the formation of a joint working group. However,

Table 1 Process of compiling "Report from the committee on statutes and clinical training of RTs"

Nov. 7, 2013	Alleged violation of the Medical Radiology Technician Law at a Kobe clinic. Three people (doctor, associate nurse, office worker) arrested for allegedly performing some imaging acts, including patient positioning and device setting.
Jun. 20, 2014	59th annual meeting of the National Council of RT Training Institutes. A Ministry of Health, Labour and Welfare official states that a student applying a probe to a human body as part of ultrasound training could be a violation of the Medical Radiology Technician Law.
Jul. 25, 2014	Request to study clinical training submitted to the Ministry of Health, Labour and Welfare and Ministry of Education, Culture, Sports, Science and Technology. Ministry of Health, Labour and Welfare requests a survey on the state of clinical training.
Jan. 19, 2015	Ministry of Health, Labour and Welfare conducts a survey to determine whether a committee should be established to study how clinical training should be carried out in the education of RTs. Forty-six RT schools are surveyed and forty-one respond (89.1 percent response rate), finding that a variety of requests were made of medical facilities regarding the clinical training of RTs, and that there was a great deal of variation between schools. Most schools (85 percent) wanted standards for the medical acts that are permitted in certain conditions during clinical training.
Apr. 10, 2015	Request submitted to the Ministry of Health, Labour and Welfare to form a committee to study how clinical training should be carried out in the education of RTs. The ministry advises that, because some of the designation regulations for RT schools cover clinical training, the overall designation regulations would need to be revised. Thus, it would be helpful to have a venue to discuss the matter with the schools.
Jun. 1, 2015	Formation of a joint working group proposed to the National Council of RT Training Institutes.
Jun. 19, 2015	60th annual meeting of the National Council of RT Training Institutes. JART's proposal is rejected.
Jun. 22, 2015	Chair and vice-chair of the 60th annual meeting of the National Council of RT Training Institutes request meeting with JART.
Jul. 2, 2015	Meeting held with chair and vice-chair of the 60th annual meeting of the National Council of RT Training Institutes. Agreement reached that JART would form a committee on statues and clinical training of RTs, and that the chair of the National Council of RT Training Institutes would take responsibility for meeting with member schools about the council sending people to serve on it.
Sep. 29, 2015	First meeting of the committee on statutes and clinical training of RTs. The committee convenes with six members from the National Council of RT Training Institutes and five members from JART. Free discussions held on topics including problems and areas for improvement in RT education, and plans for the future.
Oct. 26, 2015	Second meeting of the committee on statutes and clinical training of RTs. Discussions held on how clinical training ought to be, qualifications for clinical trainers, examples of basic acts that would be permitted under certain conditions in the clinical training of RTs, and performing Objective Structured Clinical Examinations (OSCE) and Computer Based Tests (CBT).
Nov. 25, 2015	Third meeting of the committee on statutes and clinical training of RTs Discussions held on the number of credits and instructors in the designation regulations for RT schools, and the equipment, specimens, and models needed for education.
Jan. 18, 2016	Fourth meeting of the committee on statutes and clinical training of RTs Discussions held on how to modify educational content and targets to accompany the revision of the designation regulations for RT schools, and on adding members to the committee for the national RT exam.
Feb. 22, 2016	Fifth meeting of the committee on statutes and clinical training of RTs Discussions held on the subjects and number of problems on the national RT exam. Draft report compiled.
Mar. 3, 2016	"Report from the committee on statutes and clinical training of RTs" compiled. Agreement reached on increasing number of credits from 95 to 105 and on creating new specialized subjects for diagnostic imaging.

this proposal was rejected on June 19, 2015, at the 60th annual meeting of the National Council of RT Training Institutes. On June 22, 2015, the chair and vice chair of the national council's 60th annual meeting requested a meeting with JART, which was held on July 2, 2015. At this meeting, it was decided that JART would form a committee, and the chair of the national council would take responsibility for meeting with member schools about the council sending people to serve on it.

After reaching an agreement with the national council, a committee was formed to study statutes and clinical training of RTs, with

six members from the national council and five members from JART. The committee's first meeting was held on September 29, 2015. The second through fifth meetings were held on October 26 and November 25, 2015, and on January 18 and February 22, 2016, respectively. Discussions were held on targets for the educational content in attached table No. 1 of the designation regulations for RT schools, qualifications of full-time instructors, examples and specific content of the basic acts that can be performed under certain conditions during clinical training, requirements for clinical trainers, and the subjects and number of questions on the national RT exam. These were compiled into the "Report from the committee on statutes and clinical training of RTs." When compiling the report, the committee discussed what the job of an RT would look like in the future; that the education of RTs should prepare them to play a central role and hold core responsibilities in medical care, so they can adapt to the expansion in their duties that has occurred as medical care has become increasingly advanced and complex; how to provide problem-based learning that complies with global standards and takes into consideration the so-called 2023 problem of doctor training; and how to change clinical training from an observation-based model to a participation-based model that is future-orientated.

4. Content of the "Report from the committee on statutes and clinical training of RTs" (summary)

Table 2 describes the attached table No. 1 of the designation regulations for RT schools and Table 3 describes the targets for educational content.

To improve the education of RTs, acts that students can perform as part of clinical training and standards for these acts were classified and clarified, and policies for instructors were decided. The following principles were used in this process.

(1) When performing an act, protecting the patient's rights and safety should be the highest priority. In addition, an easily understandable explanation should be provided to the patient and his/her family beforehand, and their consent obtained.

(2) When performing an act, the student should be able to fully explain what is to be practiced, and the student should be taught the techniques in advance so that he/she can perform them.

(3) Depending on the patient's condition or the student's learning level, an act may not be appropriate to perform using the standards that were set in advance. In such cases, the clinical trainer may change the standards based on the following considerations.

Table 2 Designation regulations for RT schools, attached table No. 1

Educational content		Credits
Basic fields	Basics of scientific thinking Humans and life	14
Specialized basic fields	Structures, functions, and diseases of the body Scientific basics of health, medical care, welfare; radiation science and techniques	13 15
Specialized fields	Medical imaging techniques Radioisotope examination techniques Radiation therapy techniques Medical image information Radiation safety management Medical safety management Diagnostic imaging Clinical training	17 7 7 6 4 2 5 15
Total		105

・If the student performs the act, will it be considerably more physically invasive to the patient than if an RT did it?
・Has the student sufficiently learned the techniques or acquired the knowledge required to perform the act?
・Is the student having trouble communicating with the patient or his/her family?

Table 3 Educational targets

Educational content		Credits	Educational targets
Basic fields	Basics of scientific thinking	14	Give students the ability to think scientifically and ethically, elevate their humanity, and improve their ability to act and decide independently. Acquire a wide understanding of bioethics and human dignity. Gain the abilities needed to adapt to an increasingly globalized and information-based society.
	Humans and life		
Specialized basic fields	Structures, functions, and diseases of the body	13	Understand how the structures, functions, and diseases of the human body are organized. Acquire the basic abilities needed to learn about related subjects. Understand public health in communities. Understand systems of pathology, anatomy, and pharmacology needed for intravascular administration of contrast agents and lower gastrointestinal tract examinations.
	Scientific basics of health, medical care, welfare; radiation science and techniques	15	Acquire basic knowledge about science, technology, and information science in health, medical care, and welfare. Increase comprehension abilities. Acquire basic knowledge needed to safely use radiation in health, medical care, and welfare. Increase comprehension, observation, and decision-making abilities.
Specialized fields	Medical imaging techniques	17	Understand the structure, operating principles, and methods of maintenance and management of equipment for X-ray imaging, X-ray CT, magnetic resonance imaging (MRI), ultrasound imaging, and other examinations. Acquire the knowledge and skills needed for photography and imaging, and learn about analyzing and evaluating the results. Acquire basic abilities for dealing with patients.
	Radioisotope examination techniques	7	Understand the principles of radioisotope examinations, and the structure, operating principles, and methods of maintenance and management of gamma cameras, SPECT, PET, cyclotrons, and other equipment. Acquire the knowledge and skills needed for radioisotope examinations; learn about the analysis and evaluation of nuclear medicine images and examination results; learn about evaluating doses and other aspects of radiation exposure.
	Radiation therapy techniques	7	Understand the principles of radiation therapy, as well as the structure, operating principles, and methods of maintenance and management of equipment. Acquire the knowledge and skills needed for radiation therapy; learn about analyzing and evaluating treatment plans; learn about quality management and dose evaluation with advanced radiation therapy technology and radiation therapy.
	Medical image information	6	Understand the principles of image information needed to construct medical images. Learn about the analysis, evaluation, and processing of medical images, and about medical information systems.
	Radiation safety management	4	Learn how to safely handle radiation and other tools, understand the related regulations, and acquire knowledge and techniques related to safety management in the healthcare field. Increase problem-solving abilities.
	Medical safety management	2	Understand an RT's responsibilities and scope of practice. Learn the skills needed to perform examinations appropriately, such as administration of contrast agents, with respect to infection control and medical safety. Understand the risk factors associated with administration of contrast agents, particularly how to appropriately address anaphylaxis and other serious complications. Learn how to quickly contact a doctor or obtain other assistance, and how to properly provide basic life support (BLS). Learn about regulations on medical devices and other tools; acquire basic knowledge and skills related to medical safety; understand the causes of medical accidents and how to deal with them.
	Diagnostic imaging	5	Acquire knowledge needed for diagnosing and interpreting images as part of an RT's duties. Understand the pathophysiology and clinical anatomy associated with diagnostic imaging.
	Clinical training	15	Acquire the basic practical abilities of an RT, and the knowledge and analytical abilities related to managing a radiology department at a medical institution. Learn how to deal with subjects and patients. Learn the appropriate responses to matters involving medical safety and infection control. Acquire the ability to fulfill one's responsibilities and role in team medical care.
Total		105	

(4) The acts should be things that students are permitted to experience by their final year of clinical training. Standards should be set based on educational considerations using rough estimates of the degree of physical invasiveness to the patient.

Because the objectives, means, and methods of these acts are accepted by society, even if they are performed by students without RT qualifications, they may not be construed as illegal if they can be performed with the same degree of safety as when performed by an RT. That is, these acts could be legally justified if (1) they are performed with the consent of patients and their families, (2) their purpose is legitimate for the education of an RT, and

Table 4 Examples of basic acts allowed under certain conditions

Standard I	Standard II	Standard III
Acts students can perform on their own under the advice, instruction of a trainer*1	Acts students can perform under the instruction, supervision of a trainer (clinical training instructor, etc.)*2	Acts students are not allowed to perform on their own, in principle. Students can observe a trainer (clinical training instructor, etc.)*2
X-ray imaging (assist*3) Fluoroscopy (assist) X-ray CT (assist) MRI (assist) Radioisotope exam (assist) Ultrasound exam (assist) Bone mineral measurement (assist) Non-mydriatic fundus photography (assist) Medical device servicing Image monitor servicing	Angiography (assist) External radiation therapy (assist) X-ray imaging Fluoroscopy X-ray CT MRI Radioisotope exam Ultrasound exam Bone mineral measurement Non-mydriatic fundus photography Safety management of radiation sources Explanations and consultations for radiation examinations CT simulator imaging, creation of anchors Radiotherapy planning Quality management for radiotherapy (verification tasks) Measurement of radiation leakage Quality management for medical devices Quality management for image monitors	Examinations that inject contrast agent Removing needles from venous routes, hemostasis Angiography Image guided therapy (IVR) External radiation therapy Brachytherapy Internal use therapy Preparing radiopharmaceuticals Image Interpretation (detection of abnormal findings) Imaging, other surgical support

*1 A trainer is someone with at least 5 years of work experience as an RT and sufficient training skills.
*2 A trainer (clinical training instructor, etc.) is someone who has been certified by JART as a clinical training instructor or has completed the Foundation for Promotion of Medical Training's course for training institute instructors.
*3 Assistance includes positioning.

Table 5 Subjects and number of questions on the national RT exam

Subject	No. of questions
General medical basics	30
Basic radiology (radiation biology, radiation physics, radiometry)	30
Medical imaging devices	20
Medical imaging examinations (including X-ray imaging techniques)	40
Medical image information	20
Radioisotope examination techniques (including radiochemistry)	30
Radiation therapy techniques	30
Radiation safety management	10
Medical safety management	10
Diagnostic imaging	20

(3) they are performed with the appropriate means and methods. Moreover, if the objectives of these acts (4) are seen as having relatively little risk of injury (balance with legal protections) and (5) are seen as being highly necessary (need), and they have legitimate purpose for RT education and their means are acceptable, then these requirements can be seen as fulfilled.

Table 4 shows examples of basic acts allowed under certain conditions in the clinical training of RTs. Only students who pass OSCE and CBT will be allowed to participate in clinical training. JART and the National Council of RT Training Institutes plan to consider installing CBT servers, OSCE protocols, and a certification system for medical facilities that can perform OSCE.

Table 5 shows the subjects and number of questions for the national RT exam.

5. Process following compilation of the "Report from the committee on statutes and clinical training of RTs"

Table 6 shows the process that followed the compilation of the "Report from the committee on statutes and clinical training of RTs."

After the "Report from the committee on statutes and clinical training of RTs" was compiled, it was submitted to the Ministry of Health, Labour and Welfare on March 15, 2016.[7] Then, a letter dated March 25 was sent to the National Council of RT Training Institutes,[8] asking the council to allow JART to explain the main points of the report at the council's 61st annual meeting. On April 15, each school was sent documents describing the process of compiling the "Report from the committee on statutes and clinical training of RTs."[9] On May 16, the National Council of RT Training Institutes invited JART to explain the "Report from the committee on statutes and clinical training of RTs" at its 61st annual meeting. The JART chairperson, director in charge, and secretary-general attended the 61st annual meeting of the National Council of RT Training Institutes on June 17, where they explained and answered questions about the "Report from the committee on statutes and clinical training of RTs." The assistant chief of the medical section of the Ministry of Health, Labour and Welfare's Health Policy Bureau also attended the council's 61st annual meeting. After this, the board of the National

Table 6 Process following the compilation of the "Report from the committee on statutes and clinical training of RTs"

Mar. 15, 2016	"Report from the committee on statutes and clinical training of RTs" submitted to the Ministry of Health, Labour and Welfare
Apr. 15, 2016	Documents on the process of compiling the "Report from the committee on statutes and clinical training of RTs" sent to each school
Jun. 17, 2016	61st annual meeting of the National Council of RT Training Institutes The JART chairperson, director in charge, and secretary-general attended the meeting to explain the "Report from the committee on statutes and clinical training of RTs." The assistant chief of the medical section of the Ministry of Health, Labour and Welfare's Health Policy Bureau also attended.
Jun. 30, 2016	Expanded board meeting of the National Council of RT Training Institutes The National Council of RT Training Institutes (chaired by Kyoto College of Medical Science) proposed making major revisions to the report on statutes and clinical training for RT, which was compiled jointly by JART and the council.
Jul. 28, 2016	Expanded board meeting of the National Council of RT Training Institutes Recommended 97 credits and replacing "Diagnostic imaging" with "Diagnostic imaging techniques."
Aug. 29, 2016	Expanded board meeting of the National Council of RT Training Institutes National Council of RT Training Institutes proposal drafted.
Sep. 30, 2016	National Council of RT Training Institutes proposal approved.

Council of RT Training Institutes decided to convene an expanded board of directors to study the "Report from the committee on statutes and clinical training for RTs." However, the council did not officially communicate with JART, despite the fact that the committee's report was compiled jointly by JART and the council.

On June 30, the expanded board of the National Council of RT Training Institutes (chaired by Kyoto College of Medical Science) discussed making major revisions to the "Report on statutes and clinical training of RTs," which was compiled jointly by JART and the council. On July 23, the council's expanded board met to discuss drawing up a proposal from the council. On August 29, the expanded board compiled the council's proposal, which recommended 97 credits and replacing "Diagnostic imaging" with "Diagnostic imaging techniques." On September 30, the council approved the proposal.[10)]

6. National Council of RT Training Institutes proposal

Table 7 compares the various numbers of credits for the attached table No. 1 of the designation regulations for RT schools, including those from the proposal of the National Council of RT Training Institutes.

The committee's report recommends a total of 105 credits, including 5 additional credits of clinical training. However, the National Council of RT Training Institutes proposal recommends 97 credits, a 2-credit increase. Yet, a report from a committee created by the Ministry of Health, Labour and Welfare in fiscal 2016 on improving the curriculums and other aspects of judo therapist training institutes recommended increasing the total number of credits in the designation regulations for these institutes by 14, from 85 to 99 credits.[11)] Similarly, a report by a committee created by the Ministry of Health, Labour and Welfare on improving the curriculums at training institutes for massage therapists, acupuncturists, and moxibustion practitioners recommended the total number of credits in the designation regulations for these institutes be increased by 7, from 93 to 100 credits.[12)] While the total number of credits for both national certifications, which are mainly obtained through 3-year vocational schools, are slated to be increased considerably, the National Council of RT Training Institutes proposal only recom-

Table 7 Comparisons of attached table No. 1 of the designation regulations for RT schools

Educational content		Credits		
		Current	Committee report	National council proposal
Basic fields	Basics of scientific thinking Humans and life	14	14	14
Specialized basic fields	Structures, functions, and diseases of the body Scientific basics of health, medical care, welfare; radiation science and techniques	13 18	13 15	13 18
Specialized fields	Medical imaging techniques	17	17	17
	Radioisotope examination techniques	6	7	6
	Radiation therapy techniques	6	7	6
	Medical image information	6	6	6
	Radiation safety management	4	4	4
	Medical safety management	1	2	1
	Diagnostic imaging	—	5	—
	Diagnostic imaging techniques	—	—	2
	Clinical training	10	15	10
Total		95	105	97

mended a 2-credit increase up to 97 credits. It is extremely unfortunate that after 15 years and compared to these other national certifications, institutes that train RTs have stated that an increase of only 2 credits is sufficient. For the sake of future RTs, we hope that all instructors will go back to basics and think carefully about what kind of education should be provided.

7. Conclusion

Discussions should proceed based on the "Report by the committee on statutes and clinical training of RTs," which was compiled jointly by both groups. In particular, to improve the quality of RTs and increase their standard of education, we believe the Ministry of Health, Labour and Welfare and Ministry of Education, Culture, Sports, Science and Technology need to create a committee to stipulate standards regarding which basic acts can be performed under certain conditions as part of the clinical training RT schools are entrusted with, the same as is done for doctors, dentists, nurses, and other professions. The survey conducted by JART to determine whether to establish a committee to study how clinical training should be carried out in the education of RT, showed that a variety of requests were made of medical facilities as part of the clinical training of RT and that there was a great deal of variation between schools. Further, most schools (85%) wanted standards on the medical acts that are permitted under certain conditions during clinical training. Schools also desired criteria for certifying clinical trainers. Because some of the designation regulations for RT schools cover clinical training, how clinical training should be conducted needs to be discussed when revising the overall designation regulations.

Starting in 2023, university medical programs will be evaluated to determine whether they meet international standards.[13] The purpose of this is to train doctors who can thrive on the global stage. After receiving a notice from the U.S. Educational Commission for Foreign Medical Graduates (ECFMG), the Association of Japanese Medical Colleges (AJMC) met in September 2011 to create a committee on assessments in medical school education and begin discussing a certification system. In May 2013, the Japan Accreditation Council for Medical Education (JACME) was established under AJMC, and in July 2013 assessment criteria for different fields of medical education were published in Japanese, based on the World Federation of Medical Education (WFME) Global Standards, and trial assessments were started.[14] From a viewpoint of cultivating comprehensive medical abilities, progress is being made on qualitative and quantitative initiatives regarding participation-based clinical training; increasing the period of clinical training in Japan from 52 weeks to the world standard of 72 weeks; creating curriculums with specific themes, such as medical care for elderly people or in depopulated communities; making modifications to the education of comprehensive medical abilities. Going forward, a number of issues need to be addressed, including improving clinical training for Foundation Doctors (FD); securing and improving outside educational hospitals for clinical training; sharing, coordinating with, and agreeing on educational content and plans with outside educational hospitals for clinical training; improving simulations and other forms of pre-education.[15] Education based on these kinds of global standards is expected to spread to other medical professions. Therefore, RT training must be able to adapt to globalization. The committee on statutes and clinical training for RTs, described here, represents a desire to improve education so it moves from an observational model to a participatory model for clinical training. In Japan, RTs undergo about ten weeks of clinical training. According to a 2012 survey

by the International Society of Radiographers & Radiological Technologists (ISRRT), clinical training lasts 55 weeks in Britain, 52 weeks in Australia, and 45 weeks in Canada. Even Thailand provides 16 weeks of training, showing that other countries offer more robust clinical training programs than Japan. Going forward, a committee established within the Ministry of Health, Labour and Welfare should discuss these issues further based on the "Report by the committee on statutes and clinical training of RTs." We hope the members of JART will understand the developments described above, and agree that the designation regulations for RT schools should be revised.

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Invited lecture

Current Situation and Future Perspective of Education for Radiographers and Radiologic Interpretations by Radiographers in Europe

Dr. Håkon H. Hjemly
European Federation of Radiographer Societies, President

Chair Person, Nakazawa:

The current presenter, Dr. Håkon Hjemly, is from the European Federation of Radiographer Societies. Dr. Håkon Hjemly is the manager of policy at the European Federation of Radiographer Societies. His main responsibilities for the society are related to the professional development of radiographers and critical issues in human health. After presenting in several radiology departments in Norway, he challenged international conferences, and started to present abroad. His presentations talked about the current situation of radiographers, the future purpose expected in education for radiographers, and radiographic interpretation by European radiographers. Dr. Håkon Hjemly, please start.

Dr. Håkon Hjemly

Dr. Hjemly:

Thank you very much for the nice introduction and for the invitation to this congress. I am going to speak about the current situation and future perspective of education for radiologists as well as radiology experienced by radiographers in Europe. I do this on behalf of the European Federation of Radiographer Societies. I will initially explain to you why we have such an organization as the EFRS, as that will be related to the topic I will discuss later. I will talk about our aims and what we have achieved because this is very much in line with the topic. I will then show you some results from surveys that we have conducted regarding this topic and a few of our publications. At the end of my lecture, I will also discuss a very important project for us, called the European Congress of Radiology. This is also very much related to the research activities for radiographers, their education, and their role development.

I want to discuss the Federation: I have very strong support; you can see me here in Chicago because I had a very warm coat on. I came from Norway. Our Vice President, Jonathan, is from Ireland, and we have a treasurer coming from Greece. We have a board member from Malta and another board member from the UK. We have also hired a staff CEO, Dorien, who is from the Netherlands. This helps you

understand that we are spread throughout Europe (Fig.1).

We were actually founded only ten years ago. During those ten years, we have blossomed into having 39 national societies. That means almost every country in Europe is now represented in the EFRS, so we no longer have much growth to come from that aspect of our membership. We now have a total membership of over 100,000 radiographers. However, we also have an educational wing within our organization and it is constantly increasing in number. I think there are now 61 universities from 33 different countries that are currently members in the EFRS. This means that there are also 800,000 students of radiography who are also members.

Subsequently, we now have a growing list of experts from all professional fields related to our organization. We also now have three different subcommittees that support our work: we have one in Medical Imaging, one in Radiotherapy and one in Nuclear Medicine.

The role of EFRS is to represent, promote, and develop the profession of radiography in Europe within the entire range of medical imaging, nuclear medicine, and radiotherapy. In addition, we are also involved with everything that is directly or indirectly related to radiography. Ten years ago, before we were funded, nobody performed this role. We had the ISRT, which is a worldwide organization. In Europe, however, there was little they could do. There are many countries in Europe, and very little was organized before the EFRS. There was a big need for our organization to be established.

One of the first things we had to establish was agreement on a definition of our profession because that remains to be very important. In Europe, there are over 40 countries. I don't think I over-exaggerate when I say that there are 30 or 35 different definitions of our profession. We had to make one European definition, and also include the terms peculiar to certain countries. However, when we speak about the radiographer in Europe, we have a definition that they are medical imaging and radiotherapy experts who are professionally accountable to the patients' physical and psychological well-being before, during, and after examination or therapy. Further, we take an active role in the justification and optimization of medical imaging and radiotherapeutic procedures. Moreover, we are the key persons in the radiation safety of patients and third persons in accordance with ALARA law, principle, and recommended legislature (Fig.2).

Fig.1

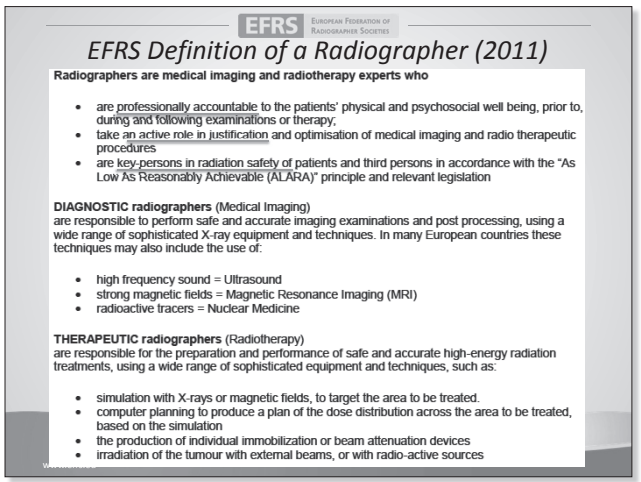

Fig.2

We now possess a more detailed definition of what entails being a diagnostic radiographer or therapeutic radiographer.

The key aim of EFRS has always been and will always be to promote patient safety and radiation protection. Before we could establish EFRS code of ethics, however, there was a very important document we needed to formulate, during the infancy of our society.

Developing European standards in professional practices was a top priority in the first years of the EFRS because we didn't have previous European standards to follow. I will talk much more about these standards soon. Promoting evidence-based practice was also one of our priorities. We also sought to promote the harmonization of initial and post-graduate education because there were and are huge differences from country to country. Even different hospitals within the same country had major differences among themselves, especially concerning what they believed a radiographer was and what they did regarding education. The status of our profession was low in big countries like Germany and Spain; this enabled countries like the Netherlands, the UK, and Portugal to be at the top level in terms of education.

We also wanted to facilitate the free movement of radiographers. Both the European commission and European politics aim for workers and patients to move freely from one country to another to work or to get treatment. We also believe it is also very important that a radiographer possess this freedom.

We cooperate with other organizations with similar objectives. I would like to mention the European Society of Radiology (ESR) in particular, and I will also talk further about them later. We also work together with the European Association of Nuclear Medicine. I will actually be at their European congress in three weeks. We will have a stand and hand out flyers for the nuclear medicine radiographers. We try to be visible where we can.

We also work very well with the European Federation of Organizations for Medical Physicists and also with the ISRT. We have a general understanding with the ISRT. We don't use interpreters because of this, as they can sometimes misinterpret what we mean.

We also have collaborations with several other organizations, such as the European commission, and with related societies like the society for MRI vendors, for radiotherapy, for national relations with tech regulators, the IREA, the World Health Organization (WHO), and many others.

I mentioned that we had to produce a few important documents and statements during our first years. We were successful, and here, I will list a few of the most important ones (Fig.3). They are all accessible at our website at EFRS.eu, and on many other websites as well. I chose these ones because they were the first ones that we focused on. We had one statement on radiography education in Europe that was published in 2012 (Fig.4). We also had one about the radiographers' role

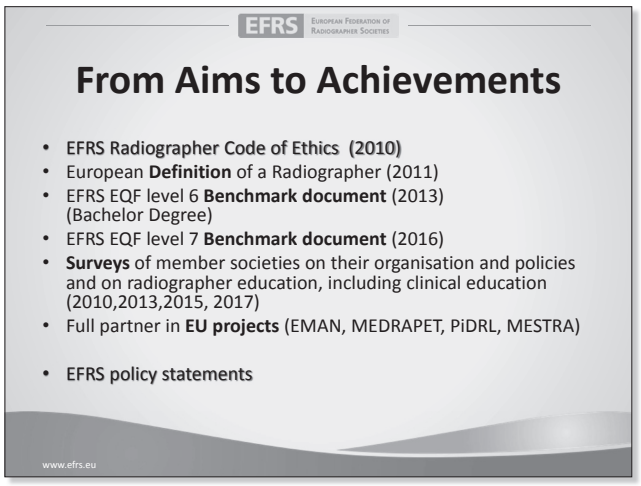

Fig.3

development as well as a statement on role development that I will expound upon later. We also had a statement on CPD - Continuous Professional Development. I also had the pleasure of attending a seminar yesterday where different leaders of patient and radiological societies spoke about their education system. Many of them mentioned that they have CPD systems. I think that is very good because they could learn a lot from many of those societies in Europe.

We had also called for the implementation of evidence-based practice in undergraduate radiography curricula. One of our newest statements is regarding radiographer research in Europe.

We need to be able to obtain data to create such a document so we did and do surveys on our members. We do this every other year. Thus, we survey all the national societies and we survey all the universities to constantly get the data we need to create the first editions of these documents and statements, and we also survey regularly to have timely revisions.

This is one result from a survey we did in 2015 on education (Fig.5); it will highlight the differences from one program to another. Most of the programs are combined. This means that when you graduate, you will have a certain amount of education on medical imaging, nuclear medicine, and radiography. It doesn't mean, however, that you are fully qualified to work in any of those fields. Different programs focus on different areas. There are also certain programs that focus only on medical imaging. There are also other programs that offer three alternatives: a program that only focuses on radiotherapy, one that only focuses on nuclear medicine, and a combination program that focuses on both medical imaging and radiotherapy.

Here you can also see the differences in length. Most of the programs are three-year programs. There are also quite a lot of programs here that are four-year programs. However, there are shorter programs as well. Some countries even have two-year programs.

We call the study points ECTS (Fig.6). Both terms are interchangeable. Most of these programs with four years have 240 study points, and the three-year programs normally have 180. So, one study year is basically 60 study points. However, a study point in one country is not necessarily the same as a study point in another country. It could be that one university demands 30 hours of education for one study point in England but another university

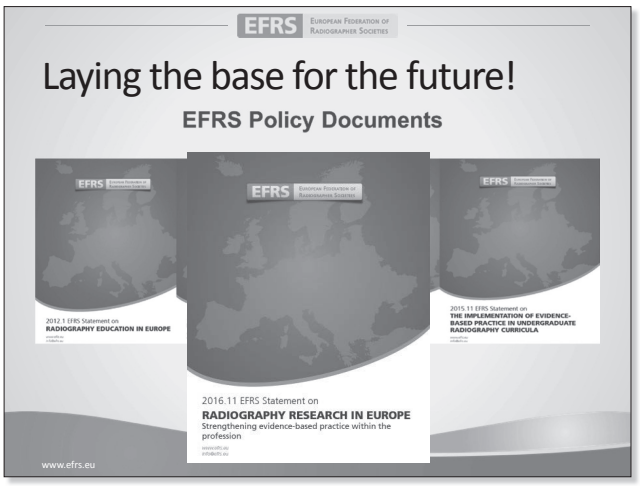

Fig.4

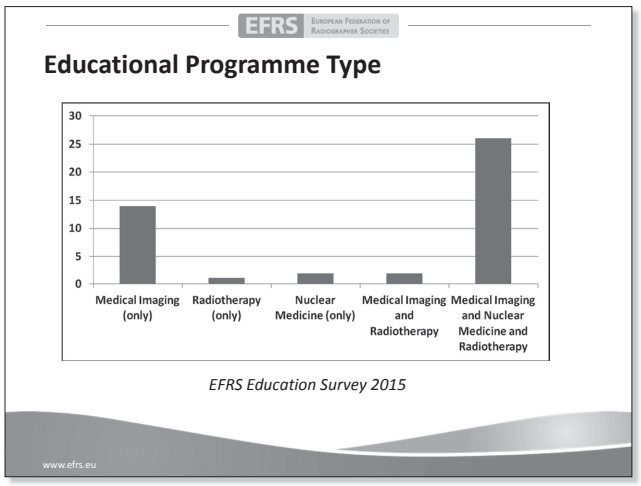

Fig.5

requires only 25 hours in another country to get the same study point. You cannot directly compare the programs from one country to another, even if they have the same number of study points. It's complicated.

The European Qualification Framework (EQF)(Fig.7), however, does not focus on study points. It tests a bachelors' degree, but what's more important is that it focuses on the learning of the program's concepts. It focuses on one's ability, knowledge, competencies, and skills. This will help the member states, educational institutions, and the employers to compare qualifications across the European Union's diverse education and training systems. Further, the core of EQF is eight levels, which I will describe in some detail. I will show you a table of these eight levels in the next slide (Fig.8). This will illuminate what the possibilities are for the student as well as illustrate complications related to the EQF.

EQF also makes it possible to compare all types of education, training and qualifications, whether professional and vocational. Everything is basically harmonized. Moreover, this implementation is coordinated at the national and European level.

You can see that I highlighted the EQF level 6, which is where the EFRS acts. We have this supported by European recommendations. It is the level where the radiographer title is granted. You can then take the Master's degree and then normally be at level 7.

What's very important in such a system is the terminology used. The wording is very critical in order to understand what we need regarding knowledge skills and competencies. Here you see an example of the generic learning outcomes related to knowledge skills and competencies (Fig.9). You will notice that when we used the term "advanced knowledge" we mean "critical understanding regarding skills." We also used "advanced skills," and this is what we say when you must demonstrate a "mastery in innovation" in

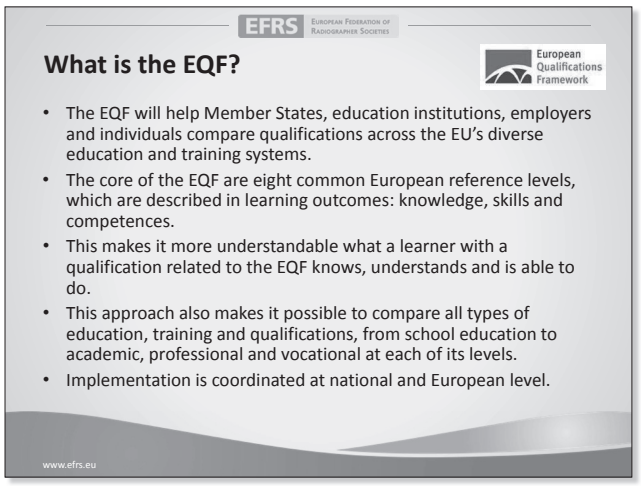

Fig.7

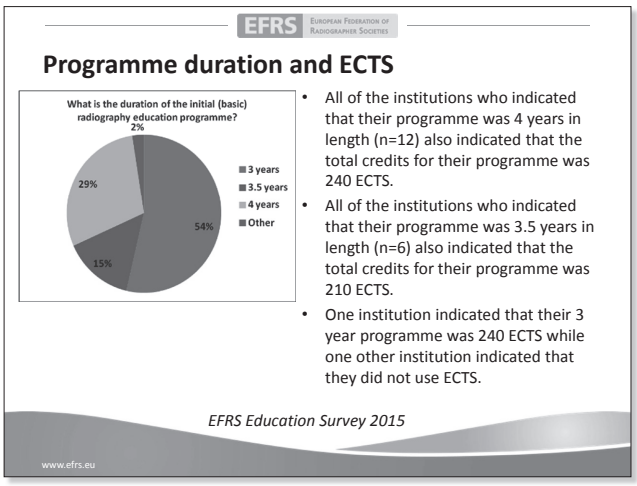

Fig.6

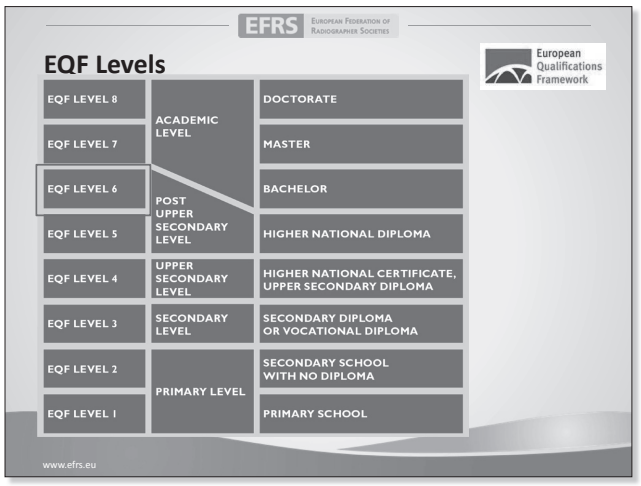

Fig.8

solving complex and unpredictable problems in a specialized field of study. Furthermore, "competence" means the ability to manage complex technical or professional activities or projects and take responsibility for decision making. I will show you this for level 6.

You can see the same generic learning outcomes for level 7 (Fig.10), but we moved up one step in regard to the learning outcomes: here we talk about highly specialized knowledge. We deal now with the forefront of knowledge, original thinking, or research; and we say, "critical awareness of knowledge" which pertains to specialized problem-solving skills. You can see, we also expect that those at level 7 will be able to manage and transform work or study contexts. You will find maybe 50 or 60 different detailed learning outcomes underneath these knowledge skills and these competencies systems.

We surveyed EQF Level 7 radiographers after asking our societies and our members whether or not they supported research to be done on a doctorate level. A high percentage said yes. Level 7 would be normally where the researchers are. 70 percent said yes to this survey two years ago and the percentage increased with the latest survey (Fig.11). The results, however, are not yet ready for presentation.

We also obtained data from our members as to why this affects them and they say that one of the benefits in introducing this level at the universities is that it will lead to more formal recognition of the radiographers who have

EFRS European Federation of Radiographer Societies

EQF Level 7 Bachelor Generic Learning Outcomes

Knowledge	Skills	Competence
Highly specialised knowledge some of which is at the **forefront** of knowledge in a field of work or study, as the basis for **original thinking** and/or **research.**	**Critical awareness** of knowledge issues in a field and at the **interface between different fields**. **Specialised problem solving skills** required in **research** and/or **innovation** in order to develop new knowledge and procedures and to **integrate knowledge from different fields.**	Manage and **transform** work or study contexts that are complex, unpredictable and require **new strategic approaches**. Take responsibility for **contributing to professional knowledge** and **practice** and/or **reviewing the strategic performance** of teams.

www.efrs.eu

Fig.10

EFRS European Federation of Radiographer Societies

EQF Level 6 Bachelor Generic Learning Outcomes

Knowledge	Skills	Competence
Advanced knowledge of a field of work or study, involving a **critical understanding** of theories and principles.	**Advanced skills**, demonstrating **mastery** and **innovation**, required to solve **complex** and **unpredictable problems** in a **specialised field** of work or study.	**Manage complex** technical or professional activities or projects, take **responsibility** for decision making in unpredictable work or study contexts, take responsibility for managing **professional development** of individuals and groups.

www.efrs.eu

Fig.9

EFRS European Federation of Radiographer Societies

EQF Level 7 Radiographers

Benefits:

- An aid to Level 7 programme development, introduction and formal recognition.
- Role development ↑
- Autonomy ↑
- Radiographer research ↑

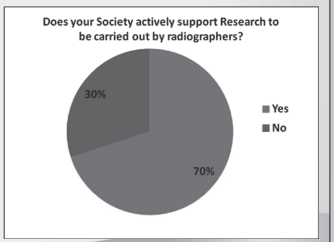

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Fig.11

taken a lot of abuse. It will help with their role development and promote an increase in the economy as well as the amount of research done by radiographers.

We also asked our members about role development, and 90% were in favor of this a few years ago. The 10 percent belonged to countries that are terribly resistant to role development for radiographers for many reasons (Fig.12). Most important among these were the radiologists' perspective. It could be due to the countries' general labor market and their economy.

After collaborating with experts, we prepared a statement on role development.

I am sorry for all the text: I thought you would be very interested in the details of this statement. Please forgive me. I can, however, read it for you. The background says:

Increasingly, radiographers are performing duties which were previously performed by other health professionals such as radiologists. This development of the radiographer's advanced role has become an integral part of modern imaging and radiotherapy treatment. Some of these advanced roles are to be found within the areas of ultrasound, mammography, and musculoskeletal image reporting. More and more countries are relying on these advanced radiographer roles to develop and improve service development and delivery. Recently, the interest shown in these roles by health professionals and management has increased across Europe.

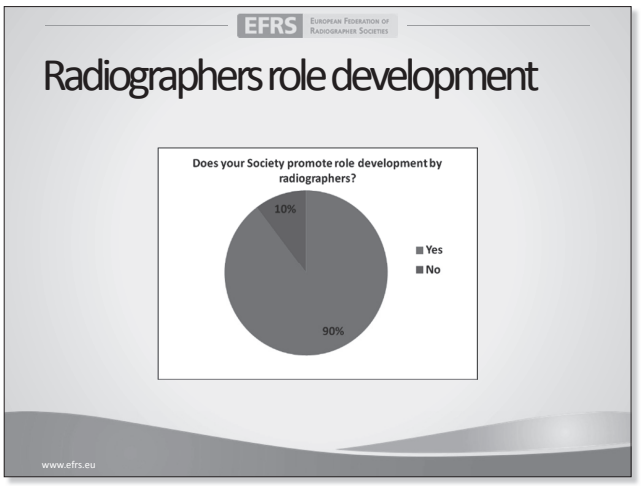


Fig.12

There are a few obvious benefits to this. Further, advanced practices can aid in the progression from EQF level 6 to EQF level 7. At EQF level 7, practitioners would have developed expert knowledge and skills in relation to the delivery of care in diagnostics or in therapeutics. Formal post-graduate university education is essential for radiographers to learn the skills and overall competencies required to take on these roles. National societies will continue to promote and develop these new roles and encourage universities to carry out the education required to underpin them.

There's a very strong focus here on the education required to be able to take on responsibilities stemming from this advanced role. According to research, radiographers working at this level have increased job satisfaction. This aids staff retention and enables radiologists to deal with more complex procedures. After all, quite a few countries struggle to get enough radiologists. Having the possibility of career progression increases the job satisfaction and also increases the interest toward becoming a radiographer.

Today, the advanced practitioner has an essential role in enabling the advancement of innovative practice where improvements in service delivery and quality patient care can occur. We conclude this with saying that the advanced practitioner is an integral part of the imaging and radiotherapy treatment team and encourages a multi-disciplinary approach both at local departmental level and in the wider

health care environment. There are some very important references also shown here (Fig.13).

I mentioned education as the important factor of being qualified to take on the role as a health practitioner. We had to survey regarding the possibilities of getting that education, because otherwise, our survey would have dealt with the lack of opportunities. There are, however, opportunities. Many of our universities offer prospects in post-graduate education, which include certificates and diplomas. Many of them even offer Masters and Doctorates.

The majority support the CPD (Fig.14), which is also very important if you have an advanced practitioner role. You need to maintain your skills. In almost half of the countries in Europe, this is mandatory. Unfortunately, however, it is not in Norway and in the other Scandinavian countries, but we are working very hard to change that. I work for the national societies in data and geographies and I am on a crusade to convince our politicians to approve mandatory CPD.

These are some samples from the UK (Fig.15). The reason for me to show samples from UK is that they started very early in their role development for radiographers and other professionals. I will not go into detail about their special system, but I will tell you a little bit about the drivers behind this. I do not think this is special to the UK as we have a similar situation in Norway where we notice that people are getting older and also that there are more people living in the same country. There is thus an increasing pressure for diagnostic imaging and also for cancer treatment. The number of radiologic exams being done in the UK for basically all mortalities has increased with every survey.

A few countries also struggle with getting enough staff. Here you can see different groups. I have a red box around the most relevant ones (Fig.16). There is a 50 percent shortage of radiologists in the UK. There is an

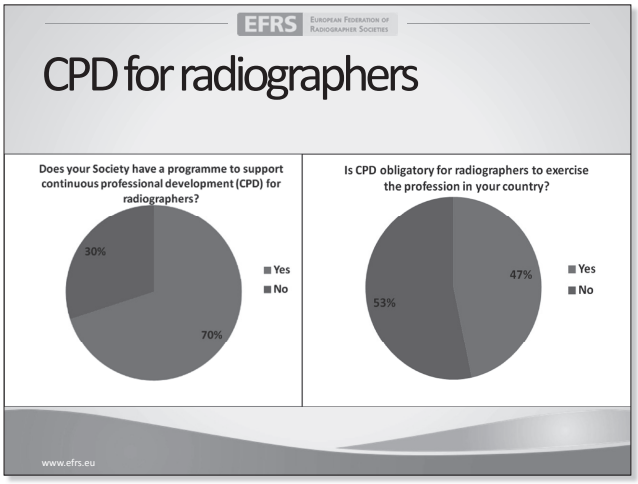


Fig.14

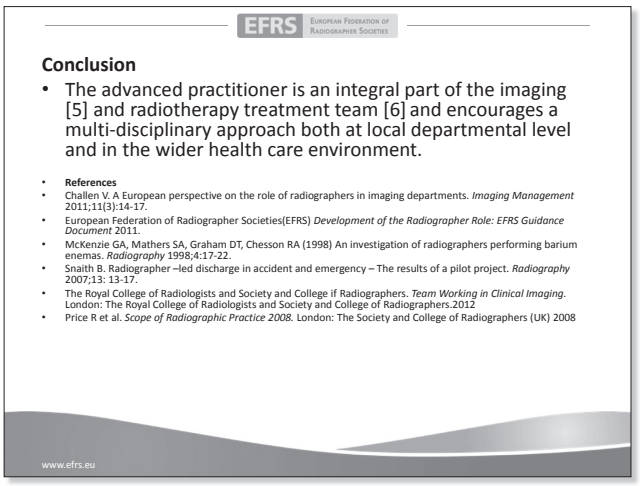


Fig.13

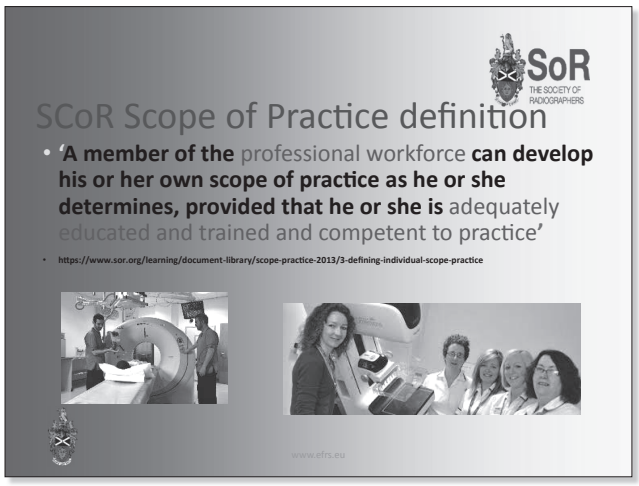


Fig.15

11 percent shortage of radiographers. There is also a 22 or 23 percent shortage of sonographers. There are not enough people in the radiology department and this leads to longer waiting times for patients, and nobody wants that. The department thus tries to recruit more radiographers and properly educate them so that they could take on more responsibilities from the radiologists and also from other groups. I will show you the wide scope of this in a moment.

They have legislation that allows them to do this. They state that a member of the professional workforce can develop his or her own scope of practice as he or she determines it, provided that he or she is adequately educated, trained, and competent. This is really needed due to the increase of the imaging exams being done in the UK, but this is also happening in many other European countries. Here you see that about 54 percent of all exams in the UK are being reported on by radiologists (Fig.17). These, however, are the reporting radiographers. They are increasing in number and they are taking more responsibility from the consultant radiologists. They now report on 10 percent of exams. The radiographers report on 21 percent of all the exams being done in the UK now. Imagine, if you took away this box, they would have huge problems.

Here you can see the wide scope of practice of the reporting radiographers or those working with advanced education (Fig.18). Although it started with simple skeletal exams, they are not limited to only those. They gradually proceeded to the axial skeleton. When they saw that this worked excellently, the dedicated radiographers with proper education and training continued to report on

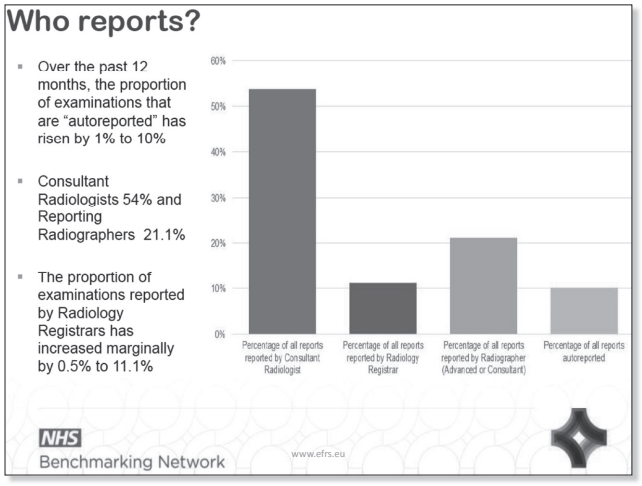


Fig.17

Radiographers report across a whole range of diagnostic imaging examinations.
Some departments indicate that they have reporting radiographers in training = workforce challenge, back fill, cost of training etc.

Where providers utilise reporting radiographers it is generally across multiple areas of practice.

Some providers still do not utilise reporting radiographers.

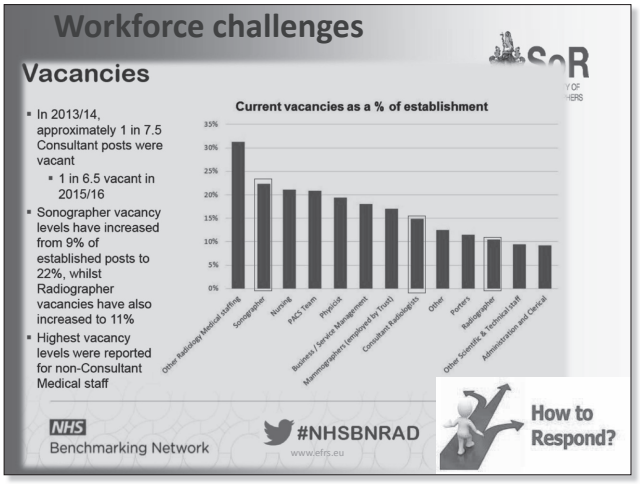


Fig.16

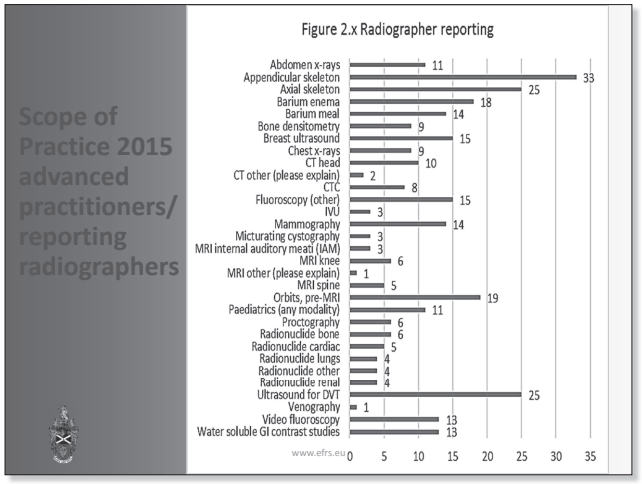


Fig.18

exams. This was introduced into all the fields that needed this extra service. You can thus find these reporting radiographers within all areas of the UK.

What distinguishes the reporting radiographers from the consulting radiologists is that these radiographers work in a narrower area. They become experts in a small area, are very good at it, and are aware of their limits (Fig.19). They are not taking over the radiologist's role.

This is not the situation in many other countries, but we are slowly arriving when it comes to role development. In the Nordic countries, there is definitely a strong drive for this. In Norway and Denmark, we now provide education for reporting radiographers. Sweden is also planning for role development in their country. Moreover, countries like the Netherlands have had this for a long time. I know that in Finland, radiographers have a four-year program that includes sonography, so when they graduate they can work independently in sonography. More and more countries are introducing advanced education for radiographers.

However, there are also countries that are really against this. We will see what the future brings. If this is a success in more and more countries, I think we will see this in the whole of Europe within a few years.

I mentioned that we cooperate with other organizations and this is something that we have to do in the European level if we want to have the success that we are aiming for on the national level as this sets an example for the other national societies. If we can solve a problem in the European level, it will be much easier for us to solve the same problem on the national level. We do not have a project related to role development of radiographers for the ESR, but I hope that will come sometime soon. We did, however, actually have a section last year at the European Congress of Radiology that dealt with radiographers and ultrasound. It was quite controversial in many European countries. At least we introduced it a little bit.

We have a very strong memorandum of understanding with the ESR. Here you can see me signing the new agreement last year (Fig.20). The agreement has basically two parts: the first deals with common issues that both of us need to solve together, and the

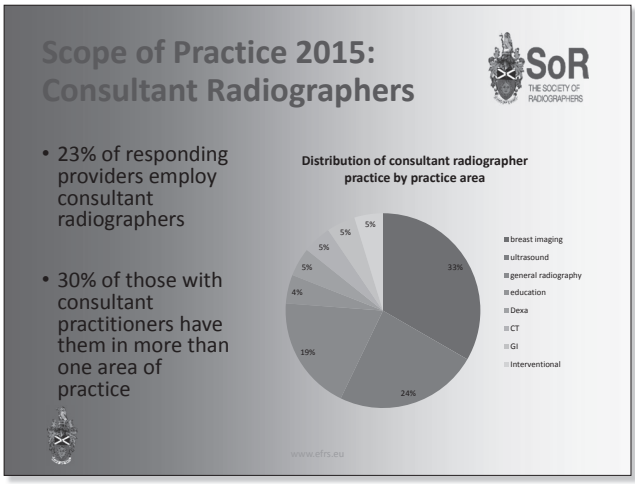


Fig.19

The breadth of practice for consultant radiographers continues to develop.

Fig.20

second one deals with the European Congress of Radiology. One of our projects is the European Diploma in Radiography. The radiology society has had a European diploma for many years and that diploma is very popular. Currently, thousands are taking the exam for this certification on a yearly basis. EFRS suggested that we should perhaps create something similar for radiographers. We liked this idea a lot. We surveyed this with our members and they agreed with us. We now have a working group looking into this. This will not be happening next year, but it could be introduced for radiographers two years from now. We also think this will have some individual benefits. It may contribute to your CV, it may differentiate you from others for a job, and it is also an international certification of your radiographer knowledge. It is a personal and professional development opportunity.

We also believe that it will also help raise the profile of radiography as a profession with radiologists and physicists and with fields like nuclear medicine, physics, and radiotherapy. It is a step forward in the harmonization of radiography standards in the profession.

It is also an aim towards the improved mobility of the workforce. Successful completion of the diploma will certify a standard of radiography knowledge deemed appropriate by our benchmark documents. The European congress is growing every year and it is the biggest congress in Europe. It's probably among the top five radiology congresses in the world. We had 26,829 people attending from 141 countries this year. We also have had a lot of people attending from their homes, online. All the presentations are being streamed and you can watch them when you have the time. I am happy to say that this has become a very successful congress for radiographers as well. We managed to have the biggest radiographer program this year. It was the first year we had a session dedicated to radiographers at any point in time across the whole week. We had 19 sessions in total.

We have held this annual meeting of radiographers in New York. This is the EFRS official congress. It is a great opportunity for CPD, and for networking with colleagues all over Europe and also all over the world. You can still send an abstract as the deadline is October 10th. If you do that, there are a couple of programs that you should be aware of: one is the "shape your skills" program. I left some of these flyers at the table by the entrance of the other building. You should bring some with you. The other one is the "invest in the youth" program. If you qualify for one of these two programs for radiographers, you may be sponsored for the congress fee and for the hotel stay in Vienna. You should really look at those and see if you qualify.

One criterion is that the applicant be member of EFRS. It costs 11 euros per year, so it is actually a no-brainer: for 11 euros, you can attend these programs if you are selected. You will have a heavily discounted fee, and it will be easier to physically attend the congress. However, members will also have the access to watch the congress electronically and on demand. Members can even watch past congresses, because there is a huge database

called Education on Demand that is part of the membership package (Fig.21). We have had radiographers working on Education of Demand for a year now. It took some time because we possess close to 700 different lectures; however, we have a working group looking at them and targeting those presentations that we think are most relevant for radiographers. This is a great opportunity for e-learning and for getting your CPD.

I mentioned the "shape your skills" program. You can take a flyer with you at the other building and read more about it. Here are some nice numbers about attendants. As you can see, Japan is up there. It is number six among the countries that send the most radiographers to ECR (Fig.22). On top, of course, the host country, Austria. My country is number second. That is something I am very proud of because there are fewer radiographers in Norway. Almost 10 percent of them go to ECR each year, which is very good.

We also have the electronic poster numbers. I remember that in 2015, Japan was on top and the same occurred in 2016 (Fig.23). I didn't bring the numbers for 2017 but I think you are still number one when it comes to sending electronic posters and getting them accepted, and I thank you very much for that. I hope you continue to send in abstracts because it is very important to show others that radiographers worldwide are involved in research.

We now introduced an honor to those sending in abstracts and those sending in electronic posters in the form of awards. We have three new awards for radiographers. These awards had already existed for radiologists, but we also now have them for radiographers. We have a paper abstract award, a poster award, and the "best radiographer student" abstract award. There are some nice prizes, too,

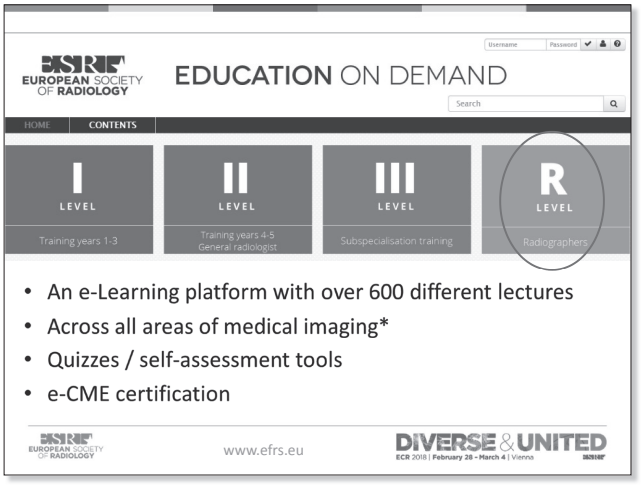
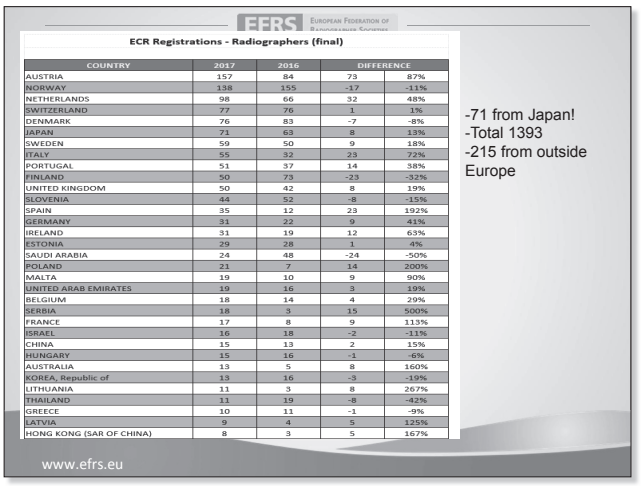


Fig.21

The ESR's new e-Learning platform 'Education on Demand' contains.

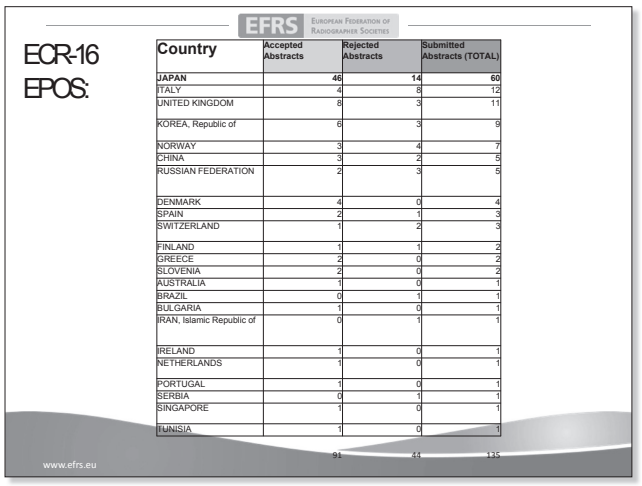
- ➢260+ eLearning Modules
- ➢360 eCME points available

NEW: R level for radiographers!



COUNTRY	2017	2016	DIFFERENCE	
AUSTRIA	157	84	73	87%
NORWAY	138	155	-17	-11%
NETHERLANDS	98	66	32	48%
SWITZERLAND	77	76	1	1%
DENMARK	76	83	-7	-8%
JAPAN	71	63	8	13%
SWEDEN	59	50	9	18%
ITALY	55	32	23	72%
PORTUGAL	51	37	14	38%
FINLAND	50	73	-23	-32%
UNITED KINGDOM	50	42	8	19%
SLOVENIA	44	52	-8	-15%
SPAIN	35	12	23	192%
GERMANY	31	22	9	41%
IRELAND	31	19	12	63%
ESTONIA	29	28	1	4%
SAUDI ARABIA	24	48	-24	-50%
POLAND	21	7	14	200%
MALTA	19	10	9	90%
UNITED ARAB EMIRATES	19	16	3	19%
BELGIUM	18	14	4	29%
SERBIA	18	3	15	500%
FRANCE	17	8	9	113%
ISRAEL	16	18	-2	-11%
CHINA	15	13	2	15%
HUNGARY	15	16	-1	-6%
AUSTRALIA	13	5	8	160%
KOREA, Republic of	13	16	-3	-19%
LITHUANIA	11	3	8	267%
THAILAND	11	19	-8	-42%
GREECE	10	11	-1	-9%
LATVIA	9	4	5	125%
HONG KONG (SAR OF CHINA)	8	3	5	167%

Fig.22



Country	Accepted Abstracts	Rejected Abstracts	Submitted Abstracts (TOTAL)
JAPAN	46	14	60
ITALY	4	8	12
UNITED KINGDOM	8	3	11
KOREA, Republic of	6	3	9
NORWAY	3	4	7
CHINA	3	2	5
RUSSIAN FEDERATION	2	3	5
DENMARK	4	0	4
SPAIN	2	1	3
SWITZERLAND	1	2	3
FINLAND	1	1	2
GREECE	2	0	2
SLOVENIA	2	0	2
AUSTRALIA	1	0	1
BRAZIL	0	1	1
BULGARIA	1	0	1
IRAN, Islamic Republic of	0	1	1
IRELAND	1	0	1
NETHERLANDS	1	0	1
PORTUGAL	1	0	1
SERBIA	0	1	1
SINGAPORE	1	0	1
TUNISIA	1	0	1
	91	44	135

Fig.23

if you win one of these.

We have made an agreement with the scientific journal called Radiography (Fig.24). This is rated as the number one international journal for our profession. It is led by an index cloud and it is the official journal of EFRS. We see submissions from basically all over the world but they mostly come from European countries. However, I would really like to see more articles coming from Japan. The latest issue deals with education in Europe, which is also a part of my topic here. I encourage you to have a look at this. It is online now and the link is displayed here. There are around ten articles related to education of radiographers in Europe in its latest issue.

To summarize, I made some bullet points, which I named The European Radiographer Today. Radiography practice is now widening. We see that more radiographers are sub-specialized. We see that more radiographers are moving toward constant practice. We see more radiographers being involved in new imaging dualities, hybrids and other modalities. We also see radiographers cooperating more directly with non-radiologist professions in a higher rate than before. It was mentioned by the previous speaker that big data and artificial intelligence is coming and I think this will have a big effect on my last bullet point here. Education is improving and expanding all over Europe. We see that the educational programs are getting more and more in line with us and they are also more in line with the benchmark document we spoke about earlier. We see that there is currently an increase in the Masters and PhD programs, and there are more English language programs as well, so you can easily go to another country, not only in England. Further, we see post-graduate education in sonography, diagnostic reporting, mammography, and colon exams among many others.

Fig.24

There's currently an increase in research activity, publications and submissions of abstracts. It will be a great sign of increasing research activity.

The congress starts on February 28th and ends on March 4th.

I hope to see you in Vienna and I thank you for your attention. Again, I thank you for the invitation and I congratulate the JTRC congress. I wish you well in the coming days. If there are any questions then I am available.

Chair Person:

OK. Thank you for your presentation. Now for questions. Are there none?

Dr. Nakanishi:

My name is Satoshi Nakanishi of Shizuoka University of Medical Science. Please forgive my poor English and lack of knowledge. Thank you very much for your excellent presentation. I have a question. You mentioned that in the definition of a radiographer, justification belongs to the radiographer. In Japan, the justification of a worker, both medical doctors and radiographers, is optimization. Japanese radiographers cannot take a radiograph without an order from a medical doctor.

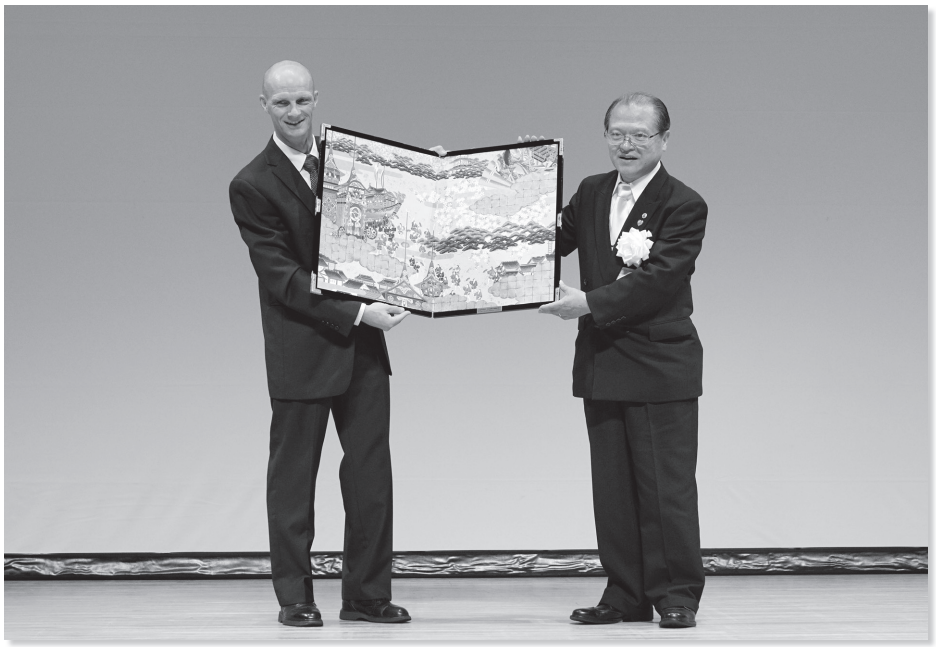
Dr. Satoshi Nakanishi :
Shizuoka University of Medical Science

My question is, in Europe, can a radiographer take a radiograph without any instruction from a medical doctor?

Dr. Hjemly:

Thank you. I fully understand your question. As you know, Europe is not one country so I cannot say yes or no to that, but in some parts of Europe, radiographers are very involved in the whole chain of action and justification. Both accept the orders of examination from the physicists checking that everything is OK. They can also say that something is clearly missing here, so they say that they could not do this exam, or simply refuse. That is the situation in quite a few countries, including Norway. However, the normal thing to do would be of course for radiographers to consult with a colleague or with the radiologist if there is uncertainty and then make the decision together. That would be the practical way to do this.

It's a very hot topic and many countries are discussing the meaning of this now. It's also becoming common for the European commission to link responsibilities.



Special Feature

JART

The 32nd Japan Conference of Radiological Technologists

Symposium 1 (Disaster Countermeasure Committee)

Response to the Kumamoto Earthquakes and Future Earthquake Countermeasures

Chairman: **Akihiro Kitagawa** (Chairman, Disaster Countermeasure Committee; Director, The Japan Association of Radiological Technologists / Nippon Kokan Fukuyama Hospital)

Kinya Ono (Member, Disaster Countermeasure Committee / Kawasaki Municipal Hospital)

Report from the Disaster Countermeasure Committee

"Survey Team for the Union of Kansai Governments"

Akihiro Kitagawa (Chairman, Disaster Countermeasure Committee)

Symposium

1. Report on the Kumamoto Earthquakes

Yasuhiro Hiai (President, Kumamoto Association of Radiological Technologists / Teikyo University Fukuoka Medical Technology Department)

2. Report from Hospitals Impacted by the Disaster

Nobuaki Anai (Aso Medical Center)

3. Operational support dispatched from JART

Hiroshi Kuwahara (Vice President of the Oita Association of Radiological Technologists/Sekiaikai Saganoseki Hospital)

4. Activities of the Japanese Red Cross Association of Radiological Technologists

Masaaki Nakata (Japanese Red Cross Kobe Hospital)

5. Activities of the National Hospital Association of Radiological Technologists

Eiichiro Konishi (Disaster Medical Center)

The 32nd Japan Conference of Radiological Technologists
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Kinya Ono
(Member, Disaster Countermeasure Committee / Kawasaki Municipal Hospital)

(Chairman) Kitagawa: My name is Kitagawa, and I am Director of the Japan Association of Radiological Technologists (JART). I would now like to open Symposium 1 of the Disaster Countermeasure Committee on the theme, "Response to the Kumamoto Earthquakes and Future Earthquake Countermeasures." I thank you all for your participation.

(Chairman) Ono: I am Ono from Kawasaki Municipal Hospital, and I would also like to thank everyone for joining us today.

(Chairman) Kitagawa: Before we get started on today's theme of earthquake countermeasures, I would like to take a few moments to deliver a brief report from the Disaster Countermeasure Committee.

Report from the Disaster Countermeasure Committee

"Survey Team for the Union of Kansai Governments"

Akihiro Kitagawa (Chairman, Disaster Countermeasure Committee)

(Chairman) Kitagawa: I will begin with a simple explanation of the Union of Kansai Governments and the Disaster Countermeasure Committee report. The "Agreement on the Prevention of Radiation Exposure during Nuclear Disasters" was accepted by the Union of Kansai Governments on August 17, 2015.

The Union of Kansai Governments includes the prefectures of Kyoto, Osaka, Hyogo, Wakayama, and Shiga, as well as Tottori Prefecture in the Chugoku district, Tokushima Prefecture in Shikoku, and Fukui Prefecture, for a total of eight prefectures. Over a period of about a year, we visited each prefecture, received the approval of prefectural governors and heads of municipalities, and concluded the agreement.

I would particularly like to draw your attention to the fact that when the regional union received the request for this agreement, not only did it promptly seek to coordinate with other prefectures, create a relief plan using established aid allocations, and notify both the recipient and donor prefectures, it also

sought assistance from the Japan Association of Radiological Technologists and prefectural radiological technologist associations, as well as coordination between prefectural groups. Moving on to what is most important: "In the event that a member of the Japan Association of Radiological Technologists is injured, contracts a disease, or dies while conducting business under the conditions of this agreement, the prefectural government shall compensate the damage in accordance with the provisions of said prefecture except in the following cases."

Until now, it wasn't always feasible for JART itself to do this; however, as one might expect, associating with a prefectural administration allows us to treat our activities as work rather than as volunteering, which is an important distinction. It has, as a result, become much easier to call on each one of you here today.

As described earlier, Shimane Prefecture joined JART in 2013, and recently entered into the Union of Kansai Governments. Once you return home to your prefecture, we encourage you to discuss the idea of membership with your people, since you are, of course, also eligible to receive compensation when you accept this agreement as members. While I don't have specific numbers for the amounts to expect, we humbly encourage you to participate.

That concludes our brief report. Thank you, everyone.

Symposiast ①

Report on the Kumamoto Earthquakes

Yasuhiro Hiai

(President, Kumamoto Association of Radiological Technologists / Teikyo University Fukuoka Medical Technology Department)

(Chairman) Kitagawa: We'll now get started on today's theme, "Response to the Kumamoto Earthquakes and Future Earthquake Countermeasures." We will begin with a "Report on the Kumamoto Earthquakes" by the President of the Kumamoto Association of Radiological Technologists. President Hiai, thank you very much.

Hiai: Thank you for your kind introduction. I am Hiai, current President of the Kumamoto Association of Radiological Technologists, and I'd like to thank everyone for allowing me to speak today about the Kumamoto earthquakes.

The primary characteristic of this event is that it was actually composed of two large quakes, a foreshock and a main shock. Although I say two quakes, in reality there were over seven shocks of seismic intensity 6 or greater. The first earthquake, on April 14, had a seismic intensity of 7; however, a quake of magnitude 7 and seismic intensity 7.3 occurred the following night. It may seem like there was a 20-minute break here, but the actual duration of the earthquakes was very long; those who experienced them felt like the shaking continued for the full 20 minutes. In addition to what I have described, a great many earthquakes of seismic intensity around 6 were occurring.

The upper part of Fig.1 shows the situation in Mashiki Town, which remains in the same condition to this day. The lower part shows the damage to the hospital. Despite these cir-

Fig.1

Fig.2

cumstances, we still had to accept many patients.

Fig.2 shows the state of the Kumamoto Red Cross Hospital. Increasingly, we were doing triage in the hallway, where we were accepting more and more patients.

A technologist association activity, the first meeting of the Kumamoto Earthquake Response Headquarters Assembly, was scheduled to convene in Tokyo the day after the foreshock occurred on April 14.

Because there was only minimal damage at the time of the foreshock, it was clear what measures would be needed, what kind of information had to be gathered about the quake, and so on. This was in the evening, but then the main shock hit that night.

Afterward, a range of relief activities was conducted, as the Kumamoto Earthquake Response Headquarters Assembly meeting was convened a second, third, and ultimately, a sixth time.

As a form of support, Vice Chairman Ogawa, Director Azemoto, and Specialist Yasukawa came from JART to the Kumamoto Prefecture Disaster Response Headquarters at the prefectural office on April 22 to discuss, when we can anything to do. They consulted widely with officials in the prefecture's response headquarters.

On the 22nd, many professionals – physical therapists, occupational therapists, medical technologists – gathered at the evacuation center, as they had been dispatched from places like the Nursing Association; however, due to the nature of the work and the type of occupation of the radiological technologists, it was not possible to conduct activities in the evacuation center. The Japan Association of Radiological Technologists therefore took the lead on dispatching technologists to the Aso Medical Center, where many patients were gathering.

I will now present a report on the results of a questionnaire administered to 140 institutions in Kumamoto Prefecture. We began the project in May, with a response rate of 57%. The questionnaire includes six items related to work and two items related to life. The items related to work were designed to shed light on what might be useful measures for the future. As for the items related to daily life, since we received relief funds on this occasion, we needed to understand certain issues and conditions through the questionnaire, in order to make the best use of support money, and to cover requests like exemptions from membership dues, and so on.

I would now like to share with you a few excerpts from the questionnaire items.

I will begin with the earthquake resistance of buildings. The Aso Medical Center is a quake-absorbing structure built with grooves that reduce the impact of tremors, and a floor reinforced with rubber. A quake-absorbing structure, by definition, protects equipment. When I think of earthquake countermeasures, earthquake-resistant construction, quake-absorbing structures and non-earthquake resistance come to mind. Earthquake resistance is generally considered to be a good thing, and I myself did not distinguish too clearly between seismic isolation and earthquake resistance. In this questionnaire, seismic isolation was very low at only 7% (Fig.3), but the Aso Medical Center is one of seismic isolation construction. Kumamoto University Hospital is also a seismic isolation structure, so there was little damage to the hospital's facilities or the equipment inside; however, in the case of earthquake-resistant buildings, the structures themselves were fine, but the equipment was damaged considerably.

Although two items in the questionnaire addressed damage to equipment, various inspection tools were destroyed, so no investigations can be conducted for the time being. I therefore divided the questionnaire into general imaging, CT, MRI, and X-ray, in order to identify the types of equipment that were actually damaged (Fig.4). From this, we could see that damage to MRI equipment was considerable. With MRI equipment, even a slight deviation makes the device incapable of producing an image.

In addition, although not in a notable position on the list, there are destroyed, high-definition monitors (Fig.5). There were many cases where high-definition monitors collapsed, breaking the screen and rendering them unusable. Something could perhaps have been done in advance for these monitors, such as preparing countermeasures to prevent collapse, but it seems that nearly 30% of the high-definition monitors were broken.

Next, we consider hospital regulations. For

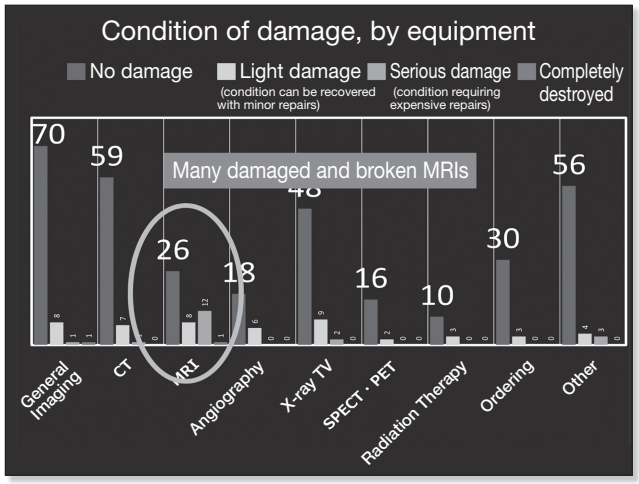

Fig.4

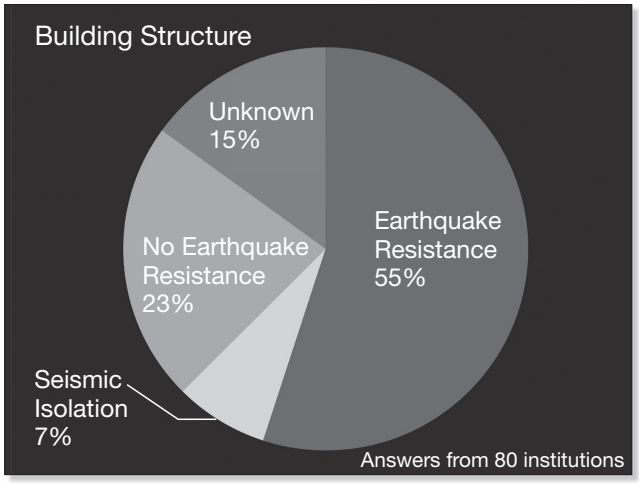

Fig.3

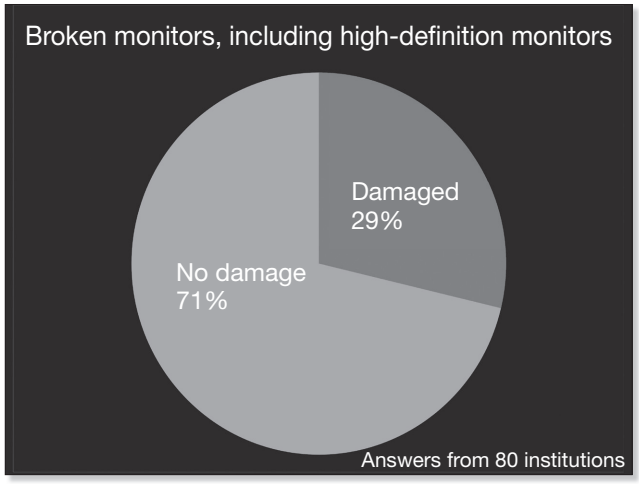

Fig.5

staff to assemble, about 70% of institutions had a policy in place for earthquakes rated over 5 in seismic intensity, but about 40% of the institutions that did not have such established, internal regulations were located in Kumamoto. The people of Kumamoto Prefecture thought an earthquake would never occur there, and did not expect it at all, but in reality, there was a fault below, and this is the kind of damage that resulted – so it may be that there was also a lack of preparation. Only 60% of hospitals had created regulations.

Let us now consider how many actually assembled. About 70% of hospitals had agreed to assemble during an earthquake of seismic intensity of 5 or more, but the percentage that gathered following the foreshock was lower than this. After the main shock two days later, everyone assembled much more quickly than they had during the foreshock; after all, preparations had been carried out once folks recognized the danger.

During this earthquake disaster, I think about, what we can do.

First, because they are in clinical practice, it is necessary to think about their work situation during the disaster and the response preparedness of the hospital in which they work, where things can take place within the hospital itself.

As for medical care during the disaster, this time I went to the Kumamoto prefectural office with members of JART, but my feeling is that we need to think about dispatching people to the hospital, as well as things we can do at the shelter.

Additionally, we need to consider what we can do for affected members. On this occasion, we received substantial relief funding. Moreover, there is a system referred to as membership fee exemption. There are hospitals where the buildings have been destroyed and shut down, but in the future, I think we should reflect further on the issue of people's jobs.

Fig.6

These are all future measures. Although it may be the subject of this symposium, what we should actually do is make advance preparations. In all honesty, the earthquake occurred in an area where no one thought an earthquake could happen, so the response was pressured and stressful. I understand that holding this symposium is one form of preparation, but I would still like to encourage everyone to practice in these areas and prepare.

Last but not least, JART's President Nakazawa came to Kumamoto on August 1, and we held a financial assistance delivery ceremony for Kumamoto earthquake disaster relief (Fig.6). We received a considerable amount of money on behalf of Kumamoto Prefecture. I would like to thank you all very much for your support. We are planning to use the funds to help affected members. You have my sincere thanks.

Now, as we say, "Do Your Best, Kumamoto!" I am doing my best at the Kumamoto Association of Radiological Technologists. We look forward to your continued support in the future. Thank you very much for your time today.

(Chairman) Kitagawa: President Hiai, thank you very much.

Symposiast ②

Report from Hospitals Impacted by the Disaster

Nobuaki Anai (Aso Medical Center)

(Chairman) Ono: Next, we have a "Report from Hospitals Impacted by the Disaster."

Anai: Thank you very much. I am Anai from the Aso Medical Center. During the earthquakes, everyone, including the members, really got to work. Thank you so much. I would like to express my sincere appreciation of your interest in having me come to give this presentation. Allow me to begin without delay.

Our hospital, Aso Medical Center, has 124 beds. The population of Aso is shown in the following figure (Fig.1). In the greater Aso area, there is a population of approximately 64,000 people.

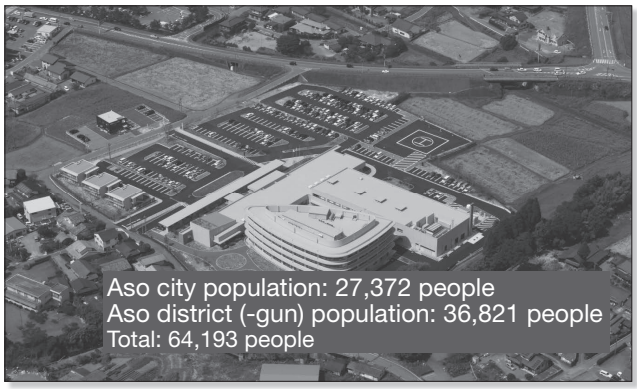

Fig.1

The hospital was renovated two years ago, and as discussed previously, now has seismic isolation and earthquake-resistant construction. The equipment used is as follows. Portable items are marked with an asterisk (*), since they represent key points later on in the presentation (Fig.2).

This was the situation when the earthquakes hit April 14 through 16. There were also mudslides in Aso. This is an enlarged image of the area where the mudslides occurred (Fig.3), and here is National Highway 57, the main road linking Kumamoto and Oita. The JR line runs basically parallel to it. You can see here that this is where it was cut across.

Because access to the main road was blocked, patients heading to the big hospital in Kumamoto City, among others, both from our hospital and from the greater Aso area, were delayed. There is another hospital in the area, but it is being forced to shut down.

All told, there were three hospitals capa-

Hospital Radiology Department Equipment

① CT device (80 rows) 1 unit
② MRI equipment (1.5 T) 1 unit
③ Tubular imaging device (biplane) 1 unit
④ General imaging equipment (1 room, 2 tube bulbs) 1 unit
⑤ FPD (flat panel display) 3 units
⑥ Portable imaging device, 2 units*
⑦ X-ray TV, 1 unit
⑧ Mammogram, 1 unit
⑨ Bone density measurement device, 1 unit
⑩ Surgical imaging device, 2 units

Fig.2

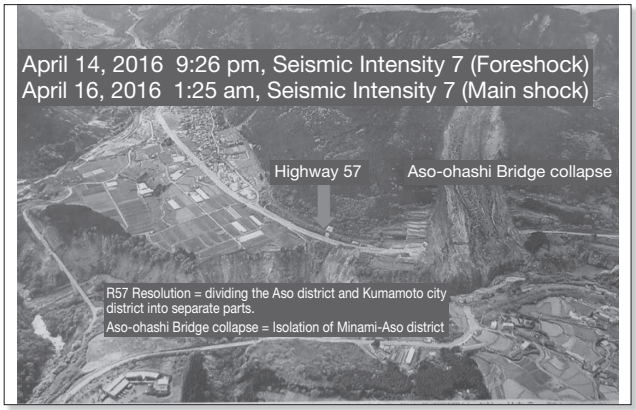

Fig.3

ble of providing emergency care. There were four, including the closed hospital, but because the other hospitals capable of providing emergency care were damaged, patients became concentrated in our hospital during the quakes.

This shows the condition of the road near our hospital (Fig.4). This is the worst area, and although there are people at the end, the destruction was so bad that there was a gap of about 2m in the road. For an idea of the condition of the hospital during the quakes, this is a biplane angiography device (Fig.5). We use whatever we can, but the axis is misaligned, so it requires some repairs.

If I can talk a little more about this, I was made deeply aware of the importance of photos such as these, taken when disasters occur. People may not be panicking, but everyone says they are focused first and foremost on returning to work, so they tend to forget to take pictures. I was keenly aware of this at the time – the idea that I should be taking as many photos as possible of the conditions after the disaster.

In terms of photos related to radiological technology, we had a lot of equipment that should have been photographed, but we forgot, so all I have with me is this one photo of the biplane angiography device with its misaligned axis.

This is a picture of another operating room, which was in this condition (Fig.6).

This is the situation on April 16 (Fig.7); at this point in time, the DMAT (Disaster Medical Assistance Team) had arrived. At our hospital, there is one DMAT, which includes a medical radiological technologist. This person had already led regular training sessions, which facilitated setting up and quickly making

Fig.4

Fig.6

Fig.5

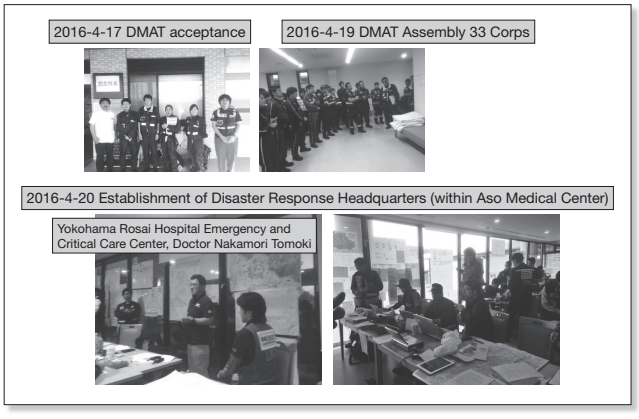

Fig.7

judgements in the circumstances, especially in regard to triage.

It felt like April 17 was the first day that DMAT Group 1 was accepted. April 19 was MAX, but we were happy to have 33 groups come to the hospital to provide assistance.

At our hospital, we typically handle things outside of normal working hours with an on-call system, but since we were seeing a lot of patients and also many refugees at this time, it was necessary for someone to be constantly on duty. Even though I say "on duty," we were not going home when our shifts were over; instead we were basically sleeping at the hospital. I remember staying at the hospital for about three days straight.

It was written as e-mail, but it was very helpful during the earthquakes. At our hospital, 1/3 people found themselves in situations that prevented them from getting to work when the disaster hit. In the immediate aftermath, people took note of which routes were passable, but it just kept raining. Mudslides took out some roads, so the route you had just taken might not be accessible anymore, and information about the situation kept changing. In order to deal with this, the hospital released an internal statement to the entire staff via our mailing list: "These are the roads that are currently open," and sent this out to everyone by email. Another thing about these routes was that it was thanks to information sent in by our staff that we were able to make sense of which routes people could take to get to work. Also, when we had damaged equipment in need of repairs, the manufacturers came to us, and at the bottom of these emails we added information to the effect of: "If you come using this route, you will be able to arrive safely," which facilitated quick response.

Since we have an emergency generator at our hospital, we used it the day after the disaster to take photos, and the following day a temporary battery car came from Shikoku Electric Power. By the evening of the second day, we had the CT and MR in operational condition.

As mentioned earlier by President Hiai, the clinical wing of our hospital is a seismic isolation structure, and the outpatient and administrative buildings are earthquake resistant. The clinical wing, placed like equipment on the front side, is a seismic isolation structure, whereas the far side is earthquake resistant; the join of the two absorbed all of the shock, leaving it in this condition (Fig.8, upper left). Initially, it was in much worse shape, but this was because the floor boards, and so on, were all out of place. I think this is due to a single area absorbing all of the shock.

This is the seismic isolation structure; there are over 70 of them in the basement. The black part is made of rubber, which absorbs all of the horizontal vibrations (Fig.8, upper right).

This is a conversation for another day, but I heard that the company that created the design said it slid 46cm. That is 46cm on one side, so it seems there was an overall dislocation of about 90cm. Once it has abruptly shifted sideways, it then slowly returns to its original position.

The first wave of the earthquakes that hit around Mashiki seems to have been a fine, horizontal vibration, but the second wave was especially damaging, including to our hospital,

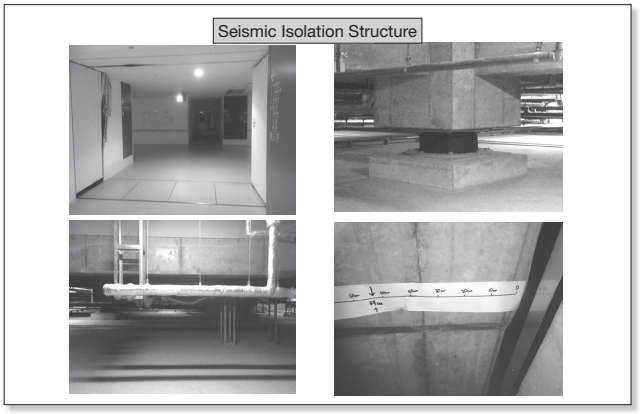

Fig.8

because the periodic amplitude was especially high. This is why I think this seismic-isolation function is incredibly helpful. I have said that the horizontal displacement was as much as 90 cm, and when I spoke with the company that designed it, they said this was possibly a record.

In our hospital, there also exists in-house power generation for facilities in the medical examination building, with electricity that lasts for about three days. In addition, water and sewage facilities are installed. Also, a temporary battery car came to assist.

This is the number of emergency visits to date, but we saw two or three times this figure just in the month of April, immediately after the event (Fig.9). This continued until around May, which I figure is about the level of increase that hospitals can expect, should they survive the disaster intact and can accept patients. At the time, we saw a huge increase in patients, even outside of the emergency care center.

Director Ono and Mr. Kuwahara, both here today, did an amazing job, along with many others, especially the Oita Prefecture technologists' association, which came right away.

The reason for coming to help was the panic that set in at the time of the disaster. Since patients just kept coming, one after the other, it was all we could do to complete the work we were committed to, leaving us no time to think about what to do afterwards. When Director Ono, who had come from DMAT, let slip the word "request," it was the first time I realized such a thing was possible, so we made some adjustments beginning the next day and had Mr. Kuwahara come. After that, members of the Oita Association of Radiological Technologists started to arrive, and that was a big help.

At our hospital, we had an on-call standby system in place for Sundays and holidays, etc., but switching from on-call standby to a rotating watch system created a strain, because of the number of people involved. Having additional support arrive was very helpful. I want to express my heartfelt thanks to everyone who came out to help.

In addition, Kumamoto City Hospital also suffered serious damage, and we got a lot of support for that.

One thing I'd like to mention is that until then, the idea of "support" was not something we considered much, but since we were able to receive it this time, I would like to remind everyone that they can get support from the Japan Association of Radiological Technologists (Fig.10).

As previously mentioned, I would like to encourage everyone in their daily preparations at hospitals and radiology departments to participate in disaster drills.

Additionally, while the phone will not al-

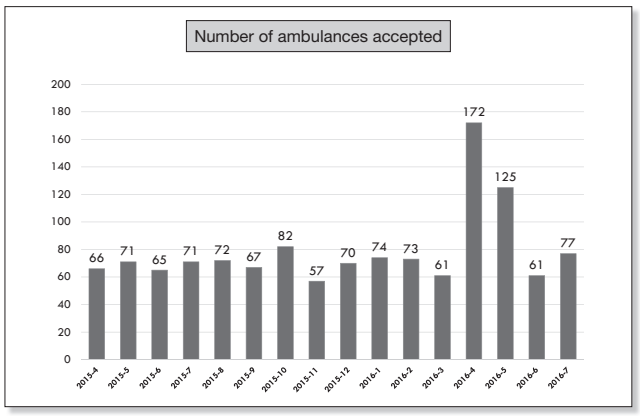

Fig.9

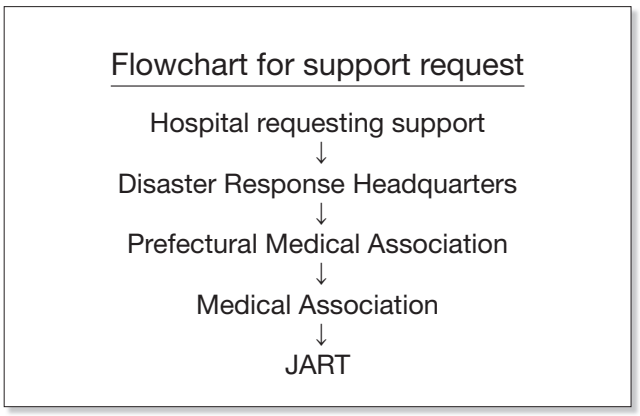

Fig.10

ways be connected during a disaster, it is still possible to communicate using e-mail, which I think is a good idea for helping the neighborhood prepare as well.

I also felt a need for satellite phones. And with around the clock shifts, I think that hospitals should prepare stockpiles of clothes and bedding.

As for the radiology department, through the drafting of an "operations manual," we can explain to engineers who come to offer support that "I am using such and such a device at our hospital," so that they can provide assistance based on that information. Moreover, I think that if we can get some of the people who regularly use the equipment into the group of engineers that offers aid at the outset, we could greatly improve the speed of assistance. By creating and distributing a manual with photos, we could facilitate the efficient reception of assistance.

If we could send a request to the Japan Association of Radiological Technologists and manufacturers to establish some kind of mailing list, at least for the Kumamoto Association of Radiological Technologists, our support network would be expanded, and we could better provide, according to the needs.

Where the road was blocked, we received a lot of support from the Oita people in the opposite direction, so instead of thinking that we need to request the technologists' association, I suggest that in future a system is created to request support from nearby districts and prefectures.

In regard to manufacturers, a troubling issue came to light when I put a portable generator in the general imaging room at the time of the emergency to take a picture of a patient, and the vacuum tube of the general imaging device kept getting in the way. Because the power was off, I could not move the vacuum tube. I think that it would be good to ask manufacturers to add an off-lock function, if possible – a release measure that allows you to move the vacuum tube at the last minute, and take a picture of the patient on the stretcher.

That's all I have. Thank you very much.

(Chairman) Ono: Mr. Anai, thank you very much.

The 32nd Japan Conference of Radiological Technologists
Symposium 1 (Disaster Countermeasure Committee)

Response to the Kumamoto Earthquakes and Future Earthquake Countermeasures: Part 2

Chairman: Akihiro Kitagawa
(Chairman, Disaster Countermeasure Committee; Director, The Japan Association of Radiological Technologists / Nippon Kokan Fukuyama Hospital)
Kinya Ono
(Member, Disaster Countermeasure Committee / Kawasaki Municipal Hospital)

Symposiast ③

Operational support dispatched from JART

Hiroshi Kuwahara
(Vice President of the Oita Association of Radiological Technologists/Sekiaikai Saganoseki Hospital)

(Chairman) Ono: As Mr. Anai mentioned in his presentation, instead of requesting support from within Kumamoto Prefecture, I assumed it would be easier to get support from neighboring Oita Prefecture, even though that prefecture was also affected. That is why I phoned Mr. Kuwahara.

I invited Mr. Kuwahara to speak today so that we can ask him about that time. He's here to talk about how JART can provide operational support. Thank you for coming.

Kuwahara: I'm Kuwahara from The Oita Association of Radiological Technologists. I work at Saganoseki Hospital in Oita Prefecture.

I'd like to report on two items. I did head out to Kumamoto as part of a DMAT (Disaster Medical Assistance Team), and so I would like to talk about that and the dispatch of technologists to provide support during disasters.

There was a large main shock at 1:25 a.m. on April 16. I was sent as part of the secondary DMAT. First, the assembly point/hospital was the Japanese Red Cross Kumamoto Hospital, but the roads were impassable—plus, there was major congestion in Aso City. There was no way to get to the assembly point. That was when I heard on the radio, "Minamiaso village is almost completely destroyed and there is no support at all." I quickly contacted headquarters and asked if I could go to Minamiaso.

I headed to Minamiaso and worked in a place called the Chouyou Village Office. At that time, there were one or two local public health nurses there as well, but everyone was in a state of panic, and one or two people were not nearly enough to handle the work. When we arrived and announced that we were a "DMAT," they were really happy.

This is a photograph of the village office. As you can see, there was no time even to tidy up (Fig.1).

First, the public health nurses asked us to take care of the dialysis patients. There was

Fig.1

Fig.2

no hospital near Aso that could perform dialysis. We weren't sure that the Aso Medical Center could accept patients, so we transferred our patients to Oita Prefecture. Later, we were told that there was "a pregnant woman who may go into preterm labor," so we transferred her to Oita Prefecture too.

There were some patients with minor injuries. Public health nurses were unable to get those patients accepted at surrounding hospitals, but once we contacted them, they responded by saying, "we will do what we can," and we were able to get several patients accepted. We also arranged with the hospitals to transfer patients who required stiches and a patient who was suspected of having a fractured right humerus.

In terms of communication, all we had was my company cell phone, which was our lifeline. We contacted the logistical support team using SNSs, such as LINE, in response to each situation.

As part of our DMAT activities, I wanted to start working as a radiological technologist, but realistically, DMAT's mission was to send patients in serious condition to medical facilities as fast as possible. It was difficult to do both jobs at the same time.

But I am aware that we, as radiological technologists, have many opportunities to work directly with emergency patients, alongside physicians and nurses. I think our skills are extremely useful.

This was Fukushima after the Great East Japan Earthquake of March 11, 2011 (Fig.2). It was quite an experience to observe the state of panic at the time. During this time, we ran out of supplies as well.

When I arrived at Minamiaso during this disaster, it was late afternoon. Without water or power, everyone became very stressed, and some of the local people were verbally attacking the public health nurses with questions such as, "when will we get some water?"

We tried to intervene, explaining that we couldn't provide water "until we have enough water for everyone." We apologized, and asked for "more patience."

Next, let's talk about the activities that dispatched technologists undertake during disasters.

Technologists are dispatched to provide support during disasters. The guidelines call for radiological technologists to be sent from JART when medical facilities in areas affected by a disaster lack radiological technology manpower. The cost of such travel is covered by JART.

These guidelines have always been in place, but personally, I always used to wonder, "what

disaster support is OK?" and "whether anyone can do it." I was not sure that we would be able to provide support from outside the affected prefecture when there was insufficient medical support in the affected site. The lack of manpower might mean that disaster base hospitals didn't have enough technologists. If so, those hospitals could not suddenly accommodate devices and electronic files. Of course, we could use paper files, if staff members were overwhelmed by the need to handle electronic files. Given the situation, I assumed that it would be difficult to send technologists. However, I was the first technologist to go, as I will explain. The Hospital Director Kai, Director Ono, and Mr. Anai discussed the Aso Medical Center outpatient department, which had received double the normal number of patients. The technologists there were exhausted and overwhelmed. I was therefore sent to the Aso Medical Center on a temporary basis, as a part of the first team, to arrange the dispatch dates (Fig.3).

The purpose of this trip was not to examination, but to reduce the load on the Aso Medical Center staff. In short, we went to provide continued and stable medical care. It does make a big difference to have a radiological technologist on site. We went there understanding that the purpose of dispatching technologists was to provide stable medical care. Between April 20 and May 8, the Oita Association of Radiological Technologists, Kumamoto Association of Radiological Technologists, Fukuoka Association of Radiological Technologists, and Saga Association of Radiological Technologists all took turns sending one technologist each to the Center.

This is a summary of the dispatch status of radiological technologists, based on documents provided by Chairman Eto (Fig.4). You can see that the numbers fluctuate. Immediately after the disaster, there were cases of DVT and takotsubo cardiomyopathy. Subsequently, the stress people experienced because they had to live in shelters for a long time, while managing various physical burdens, made it impossible to know when a large number of patients might crowd into the hospital. Under these circumstances, sending technologists to provide stable medical care at medical facilities was an effective strategy.

It has already been discussed, but the future challenge is to clarify the nature of such support systems before another disaster happens, and to inform each municipality.

It is important to clarify the ways in which support should be requested. It is not sufficiently clear whether affected facilities should submit a request to JART through the prefec-

Fig.3

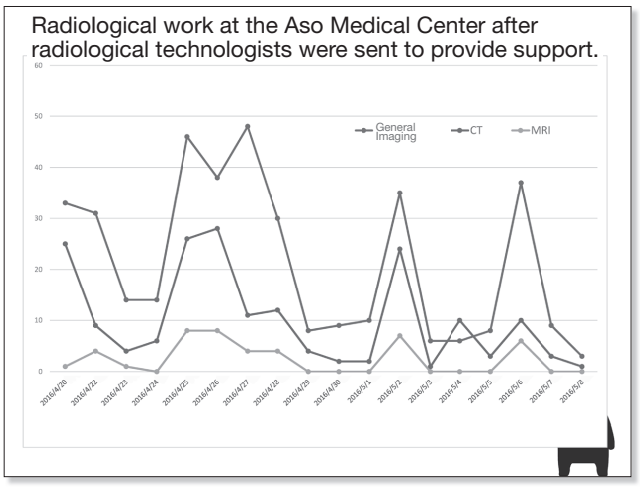

Fig.4

ture's technological association or submit a request to the prefecture's technological association through JART. We are not sure how the request documents should be prepared. The document mentioned in the report was drawn up as a trip report and request for travel costs, but the process could be simplified. There is also the issue of travel costs. Since we cannot rely on public transportation, medical support staff will need to use cars. This restriction complicates JART's procedure for requesting travel expenses. These points must all be clarified.

In summary, earthquake disasters can strike anytime anywhere. When I was part of a DMAT, the first thing we were asked to do by the local public health nurses was to manage dialysis patients.

We also need to examine ways to handle an emergency situation in which the lifelines are cut off in our own facilities.

I believe that JART's dispatch of technologists during this disaster represented an extremely rare case. In future, we will need to cooperate with the government, clarify the roles of technologists during a disaster response, and advertise our work more widely.

My most sincere condolences to those who were affected by this disaster. I also would like to thank everyone who helped us provide support on site. Thank you for listening.

(Chairman) Ono: Thank you, Mr. Kuwahara.

Symposiast ④

Activities of the Japanese Red Cross Association of Radiological Technologists

Masaaki Nakata (Japanese Red Cross Kobe Hospital)

(Chairman) Ono: It is quite difficult to provide operational support, and there is an ongoing argument about whether or not it is necessary. Mr. Nakata, who will present next, has given a lot of thought to this issue, over many years.

Mr. Nakata works at a hospital run by the Japanese Red Cross Society, and has done extensive work in disasters. I hope he can teach us about the activities of the Japanese Red Cross Society.

Nakata: Hello, I'm Masaaki Nakata from the Japanese Red Cross Kobe Hospital.

As Mr. Kuwahara and Mr. Ono have mentioned, I have been part of a DMAT from the beginning. I was also part of the relief team of the Japanese Red Cross Society, and a member of the JICA Japan Disaster Relief medical team. I have been involved with disaster relief for dozens of years, and have discussed the need for radiological technologists during disasters and additional preparations at hospitals involved with radiology with everyone here. Thank you for organizing this symposium at such a big venue.

During this disaster, I entered the site as a member of the Red Cross relief team, and worked on behalf of the Association of Radiological Technologists of the Japanese Red Cross Society. I'd like to report on that.

During the Great East Japan Earthquake, we at the disaster medicine support department of the Japanese Red Cross Association of Radiological Technologists cooperated with device manufacturers and were able to provide crucial devices. During the Kumamoto Earthquake, Association technologists provided

support from April 16th, when the main shock occurred.

In this report, I will compare what we were able to do during the Great East Japan Earthquake, and what we were able to do during the Kumamoto Earthquake, based on previous experience. I will evaluate the progress made in providing such support, and will then outline future challenges.

First, I'd like to review activities during the Great East Japan Earthquake.

Immediately after the Great East Japan Earthquake, our technologists' association requested rental support from device manufacturers via the disaster medicine support department. We secured the devices shown in Fig.1.

Where were these devices used? I was working as a DMAT member immediately after the Great East Japan Earthquake. After I returned to Hyogo Prefecture, about 10 days after the quake, I informed medical staff at the affected site that an X-ray device was available, and asked whether any facility needed one. We contacted the medical headquarters of the government of the affected prefecture, the medical supervisor of the Japan Red Cross Society, and the Japan DMAT supervisor. In response to the requests we received, we discussed details further with local supervisors.

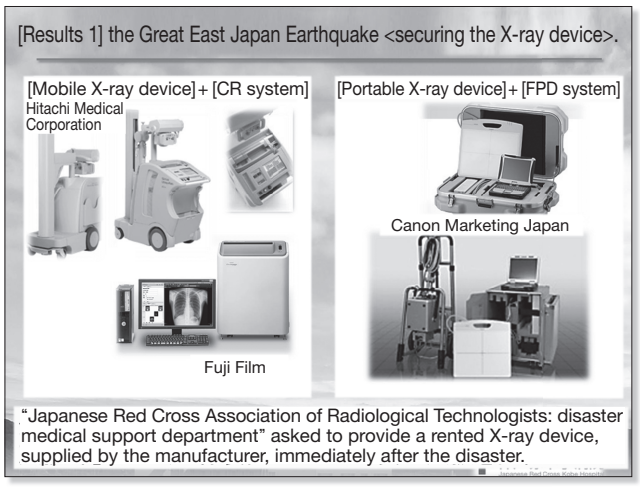

Fig.1

During the Great East Japan Earthquake, such arrangements were made by gathering information from outside the affected site. As a result, we provided device support in three locations in Iwate Prefecture and two locations in Miyagi Prefecture.

We were able to provide one device about two weeks after the quake, and two more devices two months after the quake.

Approximately a year and six months later, we analyzed whether this support was effective in six locations in Iwate Prefecture and three locations in Miyagi Prefecture.

The assessment showed that the device support was extremely effective, and that the arrangements were reasonable.

While working to provide support, we realized that, in order to meet the support needs of each site affected by the disaster, we had to look at the situation from the perspective of those affected.

We learned from this survey that human support is also necessary. It was clear that staff members like us needed to go in person to provide support to hospitals in the affected areas. There are many challenges associated with this issue. We must raise awareness of the urgent need and build an operational structure for this essential support system.

Next, let me discuss our activities during the Kumamoto Earthquake.

Hitachi, Ltd., which provided support during the Great East Japan Earthquake, offered to lend X-ray devices to medical centers on April 16th. Initially, we were able to obtain a portable device (a tiara with a wireless flat panel detector).

I arrived at the Joint Adjustment Office of the headquarters of the Japanese Red Cross Society's Kumamoto Office on April 16th, to see whether they needed an X-ray device. After two days, an evacuation shelter was set up in the gymnasium in Mashiki Town and a field medical unit, known as a Red Cross dERU, was set up. It was determined that an

X-ray device should be installed and operated at this first-aid station. Therefore, during the Kumamoto Earthquake, information was gathered at the affected sites and arrangements were made on site.

This was the Mashiki Town gymnasium. At first, we carried out medical work in a small space of about 10㎡, part of the 20㎡ space within the gymnasium (Fig.2).

This shelter was opened on April 14th, when there was a foreshock. After the main shock on the 16th, it was determined that medical activities could no longer be carried out in this space. A field clinic would be set up outside the gymnasium in the affected area. On the 19th, a dERU was opened outside the gymnasium; this became the first-aid area (Fig.3). At the back of this area, we set up an X-ray imaging area and an imaging space. On the 22nd, the X-ray device arrived from Hitachi. Imaging began as soon as this device was installed in the dERU (Fig.4).

Chronologically, the main quake occurred on April 16th, and our needs were clarified two days later. Six days later, on the 22nd, the installation of the device began. It was removed on the 27th. I think it was quite an achievement that a device could be installed in an emergency situation during the disaster so that imaging could begin.

In terms of sending radiological technologists, the relief team that was sent on April 18th included a radiological technologist. Imaging was performed in the evacuation shelter we had just set up (dERU). The supervisor of this Red Cross relief team came from the Chugoku-Shikoku block; thus, the supervisor of the Association of Radiological Technologists in the Chugoku-Shikoku block created a plan and submitted it to the headquarters of the Japanese Red Cross Society. The Red Cross HQ contacted Chugoku-Shikoku in Hiroshima, which passed on requests to each block. Ultimately, a request was sent to the director of each hospital that ultimately sent a technologist. In total, five radiology technologists

Fig.2

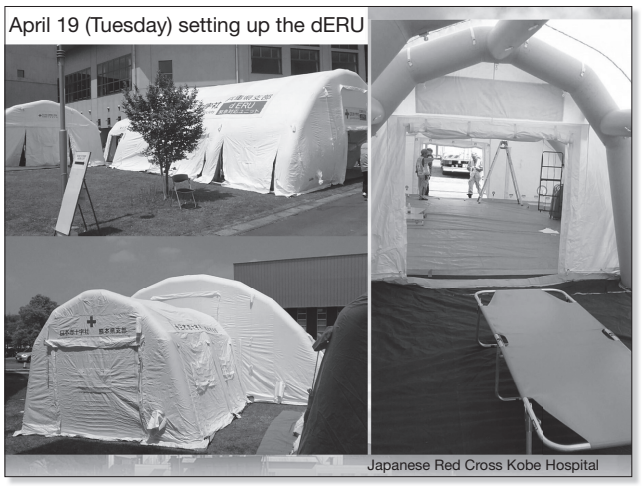

Fig.3

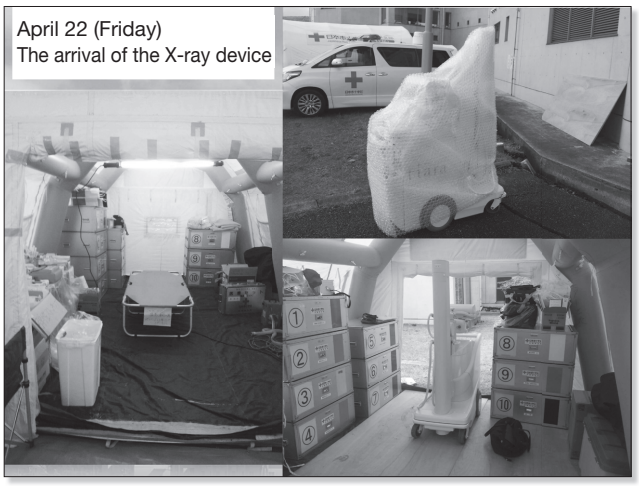

Fig.4

were sent.

As for supporting hospitals in the affected area, we contacted the Japanese Red Cross Kumamoto Hospital on the day of the main quake to see if they needed human resources support. They did not need any support in that area.

This is a picture of the imaging area, inside the first-aid station. We began our work on April 22nd and were finished on the 27th. We had a team of five technologists, and there were 17 patients who needed imaging (Fig.5).

We were able to provide support during the acute phase because we secured the device quickly, by relying on a good and cooperative relationship with the manufacturer, established during the Great East Japan Earthquake. We gained quick support with the X-ray device by surveying the imaging needs of the affected site at the beginning of the emergency.

To support the radiological technologists, the Japanese Red Cross Society HQ, which managed the relief team, connected quickly with our association of technologists, ensuring that a radiological technologist was included in the relief team. This cooperation allowed technologists to be dispatched.

In the end, only 17 patients needed imaging, but I think there was quite a bit of need during the four-day period between the 18th, when needs were confirmed, and the 22nd, when the device arrived. The short activity period of six days resulted in a small number of patients.

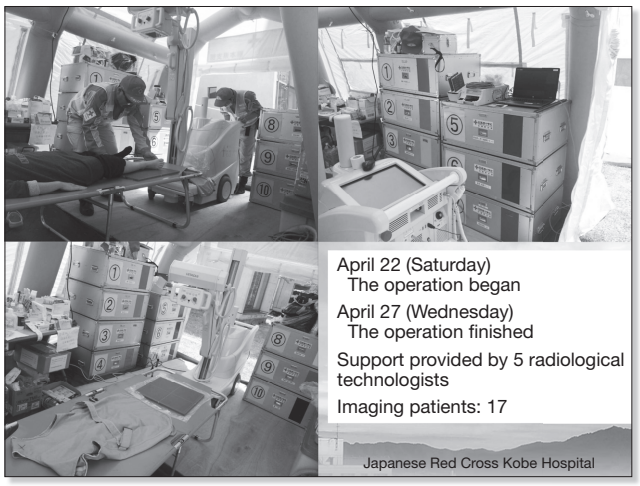

Fig.5

The reason the activity period only lasted six days was that the first-aid station changed from a 24-hour operation into a clinic that closed at 22:00, which made night-time management of the X-ray device difficult. This led to its earlier removal.

In a field clinic, devices that can be easily moved are essential. The Japanese Red Cross Association of Radiological Technologists has its own portable Canon X-ray devices; initial response teams should always use such devices. In areas that need continuous imaging, portable devices provided by manufacturers should be used to set up a good imaging system.

In summary, during the Kumamoto Earthquake, building on our experience during the Great East Japan Earthquake, we were able to provide an X-ray device and human resources support during the acute phase of the emergency. However, it was challenging to manage the X-ray device in the field clinic.

We did not have a clear operational system to provide human resources, but we were sufficiently fluid to respond to the earthquake. In future, it will be important to build detailed procedures for dispatching staff, including human resources to support hospitals in affected areas.

I would like to take this opportunity to thank Hitachi for their cooperation in providing X-ray devices.

Disaster medicine in present-day Japan began with the Great Hanshin-Awaji Earthquake on January 17, 1995. Our understanding of what we, as radiological technologists, can offer during disasters and how we can respond began with Kobe. By building on our experiences in Kumamoto, and working together —you as JART and we as the Japanese Red Cross Society's Association of Radiological

Technologists—we can reach higher and develop a support system.

Thank you.

(Chairman) Ono: Thank you very much.

Symposiast ⑤

Activities of the National Hospital Association of Radiological Technologists

Eiichiro Konishi (Disaster Medical Center)

(Chairman) Ono: Building a network day by day is important, but there is another organization, the National Hospital Organization Association of Radiological Technologists, which also has a nationwide network. There is also a base hospital, called the Disaster Medical Center, that works to alleviate disasters. I would like to hear their experience with this particular disaster. So, here is Mr. Konishi from the Disaster Medical Center.

Konishi: Hello, I'm Konishi from the Disaster Medical Center.

I will be reporting on the activities of radiological technologists working for the National Hospital Organization.

First, let me introduce the National Hospital. The whole country is divided into six groups, with 143 hospitals in operation. For radiological technologists, there is a national network of approximately 1,500 radiological technologists. The National Hospital Organization is a designated public institution under the Basic Act on Disaster Control Measures. It is therefore ready to dispatch a first-response medical team whenever a disaster occurs. Radiological technologists are not officially registered with the medical team, but are able to participate.

The National Hospital Organization of Radiological Technologists provides an organization for technologists. Originally, it was the National Hospital's association of radiological technologists, but it separated from the hospital and became independent. Today, it has a total of 170 facilities and about 1,690 members, including the National Hospital Organization, the National Centers for Advanced and Specialized Medical Care, the National Hansen's Disease Sanatoria, and the Hospital of the Imperial Household.

I reviewed the staff members dispatched from the National Hospital Organization before the Kumamoto Earthquake. During the 1999 Tokaimura JCO Criticality Accident, radiological technologists from the National Hospital were sent to survey facilities in Ibaraki Prefecture. Then in 2011, during the Great East Japan Earthquake, we were sent as support members to a facility in Ibaraki Prefecture. Technologists were also sent in to survey the Fukushima Daiichi Nuclear Power accident.

During the Great East Japan Earthquake, we conducted many questionnaire surveys. Earlier, as was mentioned in the case of the Aso Medical Center, many hospitals increased staff numbers to accommodate emergency situations. During that time, the number of staff members increased, especially as there was a need to provide additional emergency treatment for radiation exposure. Since their own homes were damaged, there were many staff members who could not go home.

These were the situations in two hospitals during the Great East Japan Earthquake

(Fig.1). A facility in Ibaraki Prefecture needed to combine emergency treatment for radiation exposure with other types of medical care; thus, they requested technologists. A technologist was sent for five days (Fig.2).

Given the situation, organizations began to examine the need to send technologists to provide emergency support.

When there is a disaster, public facilities and roads are shut down, and patients may not be able to reach their own hospitals. The National Hospital Organization does transfer staff members; many people do not live locally. Thus, if possible, staff should be sent to nearby facilities to provide support. That was the beginning.

Thinking about the emergency situations from this perspective makes it clear that there are four challenges: standards for dispatch requests; methods of requesting support; costs, payments, and compensation; and issues related to different types of facilities, such as national specialized medical research centers and the Hansen's disease sanatoria (Fig.3).

As National Hospital technologists, tasked with establishing a more extensive support system during the disaster, we submitted to the Council of Directors a proposal to enhance disaster countermeasures. Since the headquarters has radiology professionals, we argued that they should be used to enhance the disaster response system. To provide disaster training at our hospital, we perform dispatch simulations for technologists, to clarify and explain the issues. Professionals from the National Centers for Advanced and Specialized Medical Care take part in these simulations.

The Kumamoto Earthquake took place in this context. There are four national hospitals —or five, if you include the Hansen's Disease Sanatorium—in Kumamoto Prefecture, but the epicenter was near the hospitals and caused much damage. Staff members could not reach the hospitals, and on-call staff could not take any breaks, as more manpower was needed. As working staff members became exhausted,

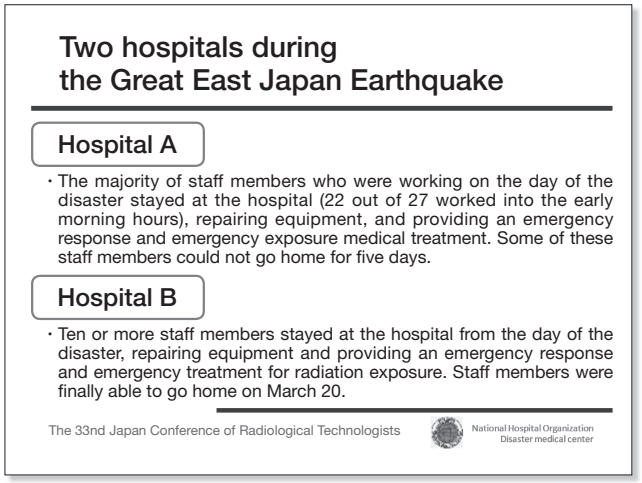

Fig.1

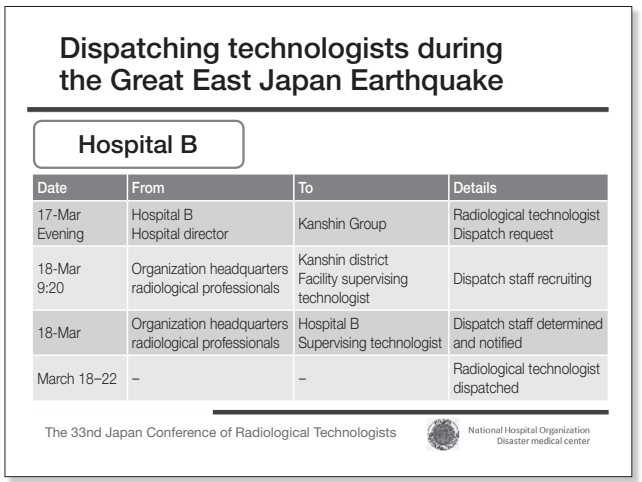

Fig.2

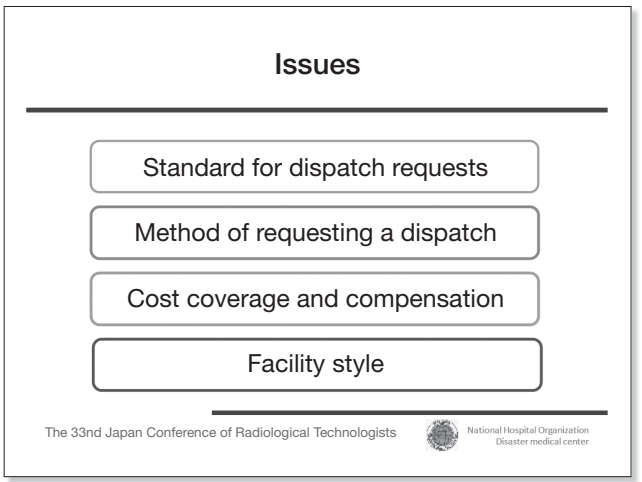

Fig.3

Hospital C in Kumamoto Prefecture requested additional technologists.

To meet this request, the facility put out a call for technologists through the director of the Kyushu group and radiological professionals. This led to the dispatching of two technologists between April 19th and 22nd. One was working at Hospital C until March, while the other was selected because he/she had experience of disaster medicine. Since the first technologist had worked at Hospital C, he/she could take over specialized tasks, including CT scans and radiation treatment.

Staff members and their families in the disaster-affected area were also victims, and some were staying in shelters in Kumamoto City. Others were actually living in their cars. Many facilities set up self-regulated attendance, but medical professionals tend to be responsible, and many of them did come to work. Many people also wanted to manage the situation in their own hospitals. This led to exhaustion and stress, making management difficult. In the future, we hope to alleviate such situations by offering support and delineating possibilities.

Another thing I thought about during this earthquake was that hospitals in affected areas must keep their staff on call, or increase the number of staff members, in order to manage. For example, in the case of Kumamoto, groups in Kyushu dispatched technologists. Nearby groups could fill the hole by dispatching a replacement technologist. There could thus be a two-stage support system.

In this way, we must develop a system of long-term dispatch. The need has been discussed, but usable devices are limited; thus, manuals and equipment must be prepared in advance.

Two hospitals outside the Kumamoto Prefecture organization requested radiological technologists. When we consulted with the headquarters of the organization for radiology professionals, we were told: "if the request comes from an appropriate source, the organization can respond."

Although it did not happen during the present disaster, we now know that the National Hospital Organization can respond; we therefore hope to propose a new style of support for future disasters.

When the National Hospital Organization provides operational support, it makes routine transfers. For this reason, as happened in the case of the technologist who was dispatched to Hospital C, technologists who have previous experience of working at a particular facility can be dispatched to that facility. There are routine lectures and seminars within groups; thus, face-to-face relationships are cultivated, to a certain degree. Since technologists can be dispatched as a part of their professional work, the cost of these transfers should be covered.

JART insurance guarantees the income of technologists; in addition, the National Hospital Organization provides insurance for members of its Association of Radiological Technologists. We have confirmed that this insurance provider will cover radiological work in the National Hospital Organization, radiological work at other medical facilities, and radiological work in emergency medical facilities.

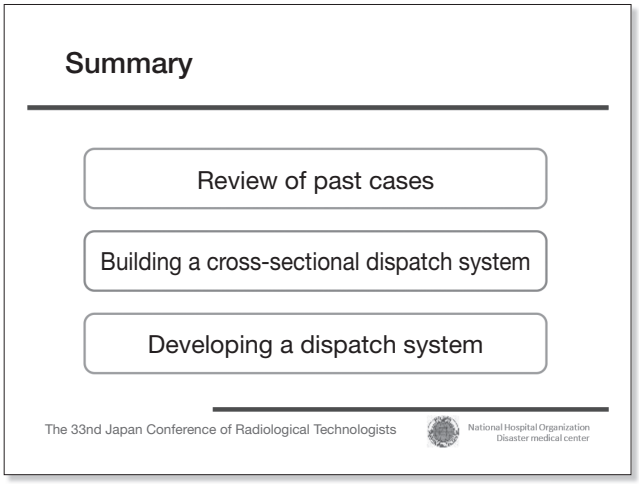

Fig.4

Thus, two out of the four issues are mostly resolved. However, we need to continue examining the issues related to facilities, such as the standards for requesting a dispatch, how and when technologists should be dispatched, and when people can request support.

In summary, there is a system at the National Hospital Organization for sending technologists to provide support when full-time staff members are on sick leave or vacation leave. This system can also be applied during disasters. Having been given this opportunity, I hope to build a dispatch system in cooperation with the Japanese Red Cross Society's Association of Radiological Technologists and JART. I would like to be able to inform municipal organizations that such a system has been set up (Fig.4).

(Chairman) Ono: Thank you.

Q&A

(Chairman) Ono: We don't have much time left, but let's have a Q&A session. If you have a question, please state your affiliation and name.

Takeda: I'm Takeda from the Center Hospital of the National Center for Global Health and Medicine.

In terms of the future, I would like to hear from the National Hospital Organization, Japan Red Cross Society, JART, other radiological technologists, and all of you, in regard to how we should share information and build relationships.

(Chairman) Ono: Thank you. Let me go first.

In the Committee on Disasters at JART, we planned this symposium. I think this is where we can build the network. There are already many networks out there. If we could nurture cross-sectional connections between these networks, we should be able to develop a large network relatively easily. We have actually been trying to make that happen. However, since this is an association of radiological technologists, as Director Kitagawa mentioned in his introduction, we are always instructed to: "first prioritize the response to radiation disasters and nuclear power disasters." By "holding conversations on operation support relating to these issues," we are just starting to build the network. Cross-sectional connections are so important. I think we should have such connections outside of disasters. What is your opinion Mr. Nakata?

Nakata: In response to the points made by Chairman Ono, the situation is complex, and there are various roles in various frameworks. So, building immediate cross-sectional connections will be difficult, as I think those who worked on site are painfully aware. Basically, there are face-to-face relationships, as well as the support from cross-sectional connections. I believe that people can be rescued through connections among people. If I start with a clearer effort based on my experience, the annual workshop on disaster support for technologists, hosted by the technological association, can lead to horizontal connections between people who actually work on site. Sharing education, a common language, and common knowledge can, in turn, lead to connections beyond the framework.

(Chairman) Ono: Mr. Konishi, how about you?

Konishi: I had the opportunity to be part of the Arrangements for Medical Assistance Headquarters in Kumamoto Prefecture, and was able to work in Kumamoto. The general

opinion was that "there aren't enough radiological technologists or lab technicians. We need more support." JART was the first organization to be contacted. We were informed that we should first contact the associations of radiological technologists and laboratory technicians. As emergency SOS information usually reaches JART first, workshops like those proposed by Mr. Nakata could build horizontal connections, making operations run more smoothly.

(Chairman) Ono: Thank you. In terms of support requests, Mr. Konishi just mentioned that there was a request for support. Chairman Hiai, was there a prediction that Kumamoto City would have more problems than anyone expected? Did you learn anything specific? Was there a request for support—anything of that sort?

Hiai: I think the problem was that there was no network to bring in support staff. I got a lot of information from my technologist colleagues and friends who were DMAT members. I did hear that there was support from Hitachi, but we had no idea what the level of support was.

There was some information about support during this disaster, but we could not figure out which organizations or how many organizations were working in Kumamoto. There was just sporadic information: there was support here, there was support there. It is therefore important to clarify the situation on site. JART should play a role in connecting these bodies.

(Chairman) Ono: Thank you. I think we need to discuss this more, but there isn't enough time. As Mr. Anai mentioned, we did hear from hospitals during the Great East Japan Earthquake that "they did not expect any support." I would therefore like to provide a proper summary of future disaster countermeasures established by JART.

This concludes the Disaster Countermeasure Committee Symposium. Thank you for your time.

(Chairman) Kitagawa: Thank you.

A follow-up system of radiograph interpretation reports by the remote diagnostic reading doctor at our hospital

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Key words: follow-up system, remote diagnostic reading doctor, remote medical system

【Abstract】
In our hospital, two diagnostic reading doctors (one on-site, one remote) read CT and MRI images. When they encounter acute findings or evidence of infectious diseases, or when important findings are overlooked, a remote diagnostic reading doctor, unlike an on-site doctor, cannot contact the attending physician immediately. Therefore, the radiological technologists and medical clerks developed a system in June 2012 through which follow-up with attending physicians was made possible. We report the details of this system and the results of the first two years of use.

1. Background

1.1 Remote diagnostic imaging

Recent advances and specialization in medical care have led to major improvements and advances in the diagnostic capabilities of computed tomography (CT) and magnetic resonance imaging (MRI) and to increasing demand for radiodiagnosis of medical images by diagnostic radiologists. However, there are only 5,000 diagnostic radiologists in Japan; the percentage of diagnostic radiologists in the Japanese population is approximately one-third that in the West[1)].

The situation described above has increased the expectations for remote diagnostic imaging. Remote diagnostic imaging takes advantage of developments in telecommunications infrastructure and information technology to send medical CT images, MRI scans, and other medical images to a diagnostic radiologist at a remote location, enabling the radiologist to support diagnostic imaging at medical facilities with no diagnostic radiologist. By creating more opportunities to receive diagnoses from diagnostic radiologists, who are experts in diagnostic imaging, this system is anticipated to improve the quality of medical care and lead to a reduction in the temporal, physical, and financial burdens on patients[2), 3)].

1.2 Current status of diagnostic imaging at our hospital

Our hospital is a smaller general hospital with 302 beds and 31 departments (internal medicine, nephrology, cardiology, neurology, respiratory medicine, gastroenterology, hematology, rheumatology, surgery, plastic surgery, orthopedic surgery, neurosurgery, pediatrics, pediatric neuropsychiatric development, obstetrics and gynecology, ophthalmology, otorhinolaryngology, urology, dermatology, clinical laboratory, anesthesiology, pathology, oral and maxillofacial surgery, radiology, radiotherapy, chemotherapy, palliative care, rehabilitation, emergency/general medicine, home care, and health management). Diagnostic imaging at our hospital is conducted using two

CT systems (a 16-row system and a 64-row system) and one MRI system (1.5 T). From April to October 2014, an average of 38 ± 6.9 CT scans and 16 ± 2.8 MRI scans were conducted per day; these images were interpreted by an on-site doctor and a remote doctor. The on-site doctor conducts imaging diagnosis for inpatients and emergency patients; the remote doctor conducts imaging diagnosis for first-time patients. This division of labor allows our hospital to manage the increasing demand for diagnostic imaging.

In this system, when the radiograph interpretation reveals acute findings or infectious disease, or when important findings are determined not to have been reflected in the examination, the on-site doctor can inform the attending physician directly using the personal handyphone system or the electronic medical record system. However, the remote reading doctor does not have access to this correspondence network. Consequently, the treatment of acute phase patients or patients with infectious diseases may be delayed.

Therefore, our hospital has enacted a system to enable reliable sharing of information with the attending physician in cases in which remote radiograph interpretation reports contain the findings described above.

2. Objective

In June 2012, with the cooperation of a medical clerk, our hospital initiated a system to follow up remote radiograph interpretation reports by a radiological technologist. We report the details of this follow-up system and the results, approximately 2 years after initiation.

3. Methods

3.1 Follow-up of remote radiographic interpretations

3.1.1 Steps in the follow-up system

The steps in the system, from the return of radiograph interpretations by the remote diagnostic reading doctor to follow-up care, are shown in Fig.1. First, most remote radiograph interpretations are returned the day after the interpretation is requested. Once the report is returned, it is uploaded onto the Radiology Information System (RIS), which is coordinated with electronic medical records to enable referencing of the reports in the medical records. Next, the radiological technologist checks the interpretation to confirm the patient's name, ensure there are no typographical errors, and check the content of the report. If the radiological technologist has any questions, the remote reading doctor is asked to interpret the image again. These tasks are performed by the radiological technologists in charge of CT, MRI, and ultrasonography in the morning as they conduct tests.

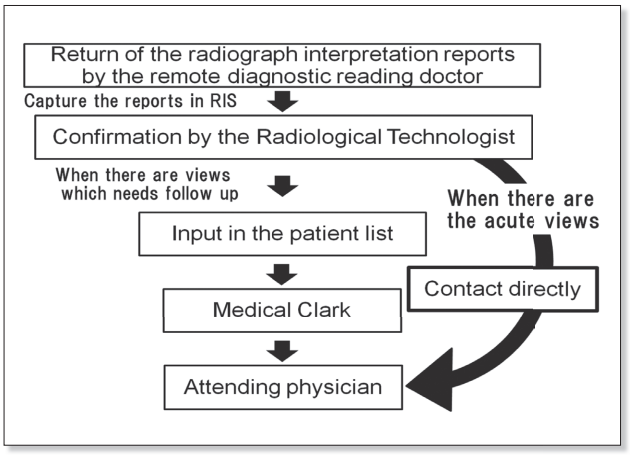

Fig.1 Follow-up system of radiograph interpretation reports by the remote diagnostic reading doctor

Upon checking the contents of the report, if there are acute or important findings, the radiological technologist adds those findings to the list of patients requiring follow-up. Referring to this patient list during outpatient examination enables the necessary treatment measures to be taken. Interpretation reports with findings requiring follow-up are also conveyed to the attending physician through the medical clerk to ensure that the information is conveyed

properly. When there are acute findings, the radiological technologist contacts the attending physician directly to convey the information more rapidly.

3.1.2 Patient list in the follow-up system

An excerpt from an actual patient list used in the follow-up system is shown in Table 1. There is one follow-up system patient list for each department that requests tests; findings requiring follow-up are entered by the radiological technologist. This list can be viewed at any electronic medical chart terminal; therefore, the communication of interpretations by the medical clerk and references to this list enable the necessary treatment to be performed during outpatient examinations. When a treatment is performed for a given test result, entering "finished" in the "communication of report" column makes it possible to confirm that the necessary treatment has been provided in outpatient care.

Table 1 Excerpt of a patient list in the follow-up system

Departments	Test day	I.D.	Name	Views	Next consultaion day	Transmission of views
Internal medicine	July 3rd	****	******	Doubt of the right mesopharyngeal tumor	July 4th Dr.A	finished
Internal medicine	July 19th	****	******	Vater's papilla tumor	July 26th Dr.B	finished
Internal medicine	July 22th	****	******	Doubt of the gallbladder cancer	August 6th Dr.C	finished
Internal medicine	July 29th	****	******	Doubt of the lung cancer and lymph node metastasis	August 8th Dr.D	
Surgery	July 17th	****	******	Thickening stomach wall	July 23th Dr.E	finished
Surgery	July 18th	****	******	Doubt of the breast cancer	July 29th Dr.F	finished
Surgery	July 19th	****	******	Thickening cecum wall	July 26th Dr.G	finished
Surgery	July 24th	****	******	Doubt of the uterine cancer	July 31th Dr.H	
Urology	July 4th	****	******	Doubt of the gastric cancer	July 11th Dr.I	finished
Urology	July 18th	****	******	Thickening rectum wall	July 25th Dr.J	finished

3.1.3 Information in the follow-up system

Follow-up is performed for anything classified as one of the four items shown in Table 2, including "other parts," "acute phase," "infectious disease," and "consultation day." When a report contains information for "other sites", the information is entered into the patient list and the interpretation is communicated in accordance with the follow-up system described in section 3.1.1. When information is classified as "acute phase" or "infectious disease," the information is entered into the patient list and the attending physician is contacted. When information is classified as "consultation day," the information is entered into the patient list and the department nurse is contacted.

3.2 Tracing survey

A tracing survey was conducted of the 6,252 CT scans and 2,673 MRI scans conducted at our hospital from June 2012 to February 2014; images from these scans were interpreted by the remote diagnostic reading doctor. Electronic medical records were used to investigate the following: ①number of items requiring follow-up, ②departments requesting radiological tests that required follow-up, ③items followed up, and ④progress after follow-up.

Table 2 Information in the follow-up system

Item	content	note
Other parts	When there is the malignant views in a part unlike the purpose.	
Acute phase	When there is the views that immediate treatment need. Ex)Artery dissection , Gastrointestinal perforation et al.	**Contact the attending physician**
Infectious disease	When there is the views that immediate treatment need. Ex)Tuberculosis et al.	**Contact the attending physician**
Consultation day	When there is the malignant views and not the next consultation reservation more than one month or no one.	**Contact the department nurse**

4. Results

4.1 Number of items requiring follow-up

Fig.2 shows the percentage of follow-up items of all radiograph interpretations by the remote diagnostic reading doctor. A total of 309 cases (CT: 274 cases, MRI: 35 cases) required follow-up, including 4% of all CT cases and 1% of all MRI cases.

4.1.1 Departments requesting tests

Fig.3 shows the number of tests requiring follow-up by the department that requested the test. The department that requested the most CT tests requiring follow-up was internal medicine/surgery, both approximately 30% of all requests. The urology department submitted approximately 20% of requests that required follow-up. The department that requested the most MRI tests that required follow-up was urology, which submitted approximately half of all requests, followed by internal medicine/surgery, which submitted approximately 20% of all requests.

4.2 Items that required follow-up

Fig.4 shows a breakdown of the items that were followed up. For both CT and MRI, the most common item requiring follow-up was "other sites." "Acute phase" accounted for approximately 10% of all items followed up. In CT, 1 case each of "infectious disease" and "consultation day" required follow-up.

4.3 Progress after follow-up

Fig.5 shows the percentage of cases in which follow-up treatment was administered of the total number of cases requiring follow-up; treatment was performed for 87% of CT cases and 74% of MRI cases.

Table 3 shows the interpretation results and the treatments performed for cases in each follow-up item. Results of "acute phase" cases included an aneurysm increasing in size and in danger of rupturing. We informed the attending physician when the reports were returned. For all acute phase cases, treatment on the scheduled consultation day was sufficient.

For the "infectious disease" case, the interpretation result was re-examination 3 months later due to suspicion of tuberculosis or non-tuberculous mycobacterial infection. In this case, we again informed the attending physician when the report was received; treatment on the scheduled consultation day was sufficient.

In the "consultation day" case, CT was performed provide a detailed examination for high levels of carcinoembryonic antigen. We interpretated the result as rectal cancer with suspected invasion of the bladder. The case re-

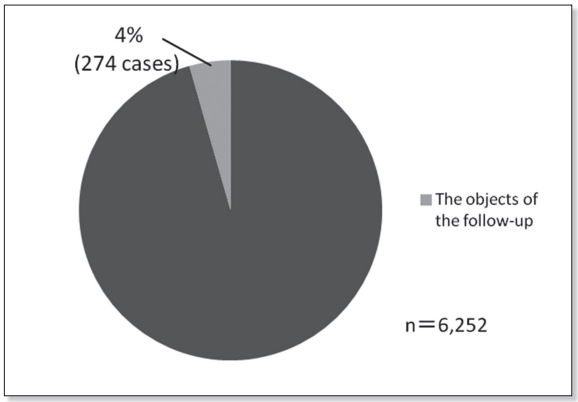

Fig.2-1 The ratio in the CT

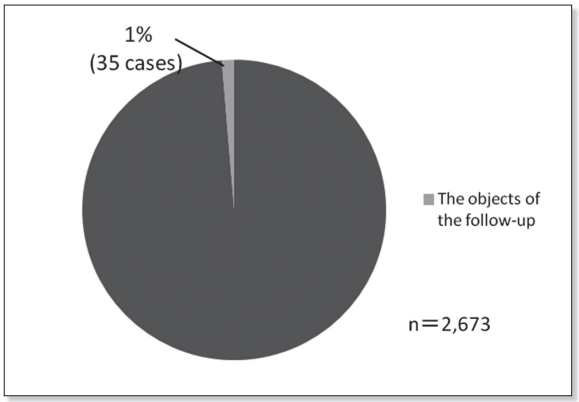

Fig.2-2 The ratio in the MRI

Fig.2 Percentage of cases that required follow-up, of all radiograph interpretations by the remote diagnostic reading doctor

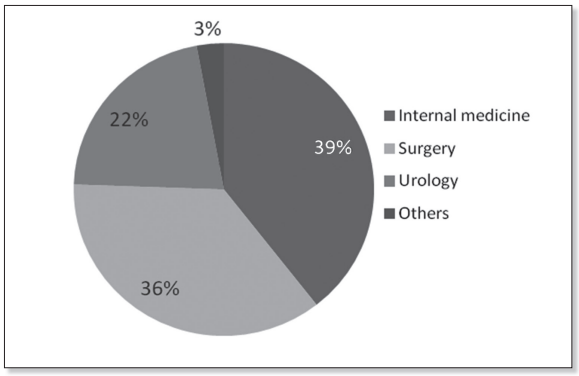

Fig.3-1 The details in the CT

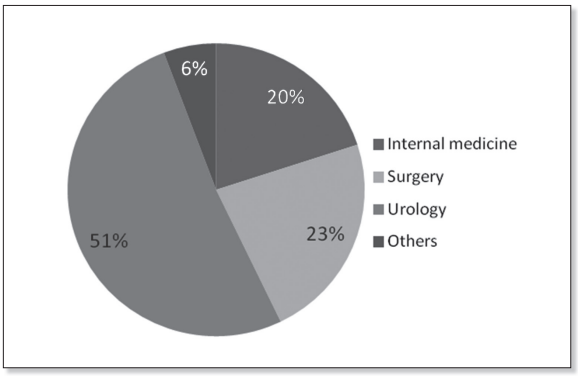

Fig.3-2 The details in the MRI

Fig.3 Clinical departments that requested medical imaging tests

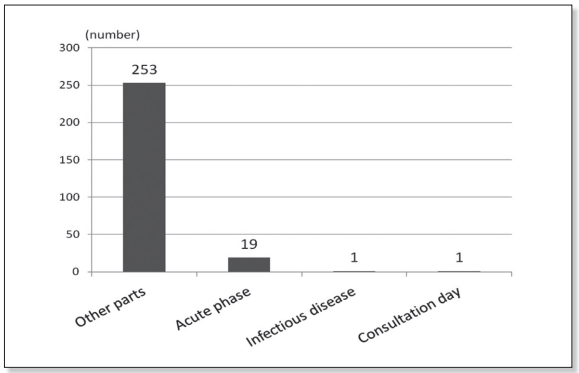

Fig.4-1 The details in the CT

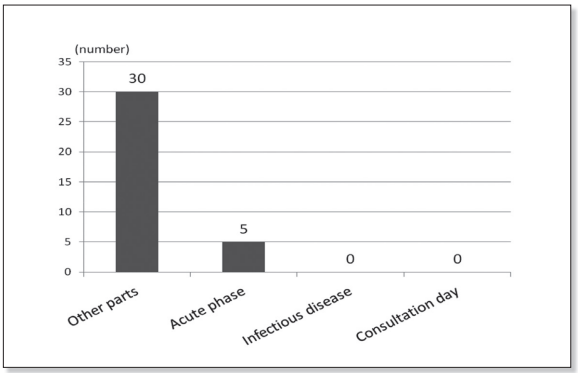

Fig.4-2 The details in the MRI

Fig.4 Details of items requiring follow-up

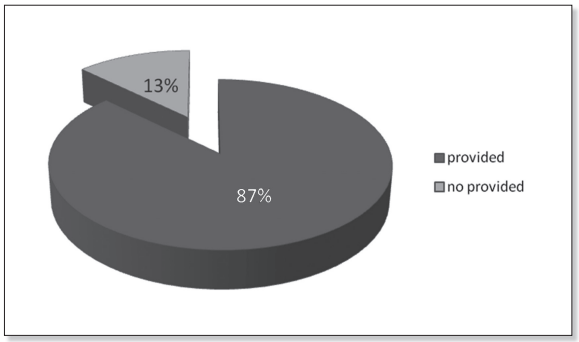

Fig.5-1 The ratio in the CT

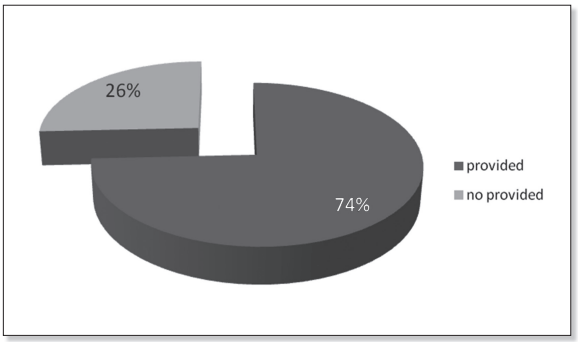

Fig.5-2 The ratio in the MRI

Fig.5 Percentage of recommended follow-up treatments that were administered

Table 3 Contents of follow-up treatment

Item	Interpreting result	Treatment
Other parts	Show in the fig.6 , because there is much number of cases.	
Acute phase	Aneurysm(the danger of rupturing) Artery dissection Gastrointestinal perforation et al.	Presenting other hospitals(ligation and embolization coil) Conservative treatment
Infectious disease	Doubt of tuberculosis or non-tuberculous mycobacterial infection	Re-examination 3 months later
Consultation day	Rectum cancer and infiltration of the bladder	**Advance the next consultation day by 2 months and give an additional examination.**

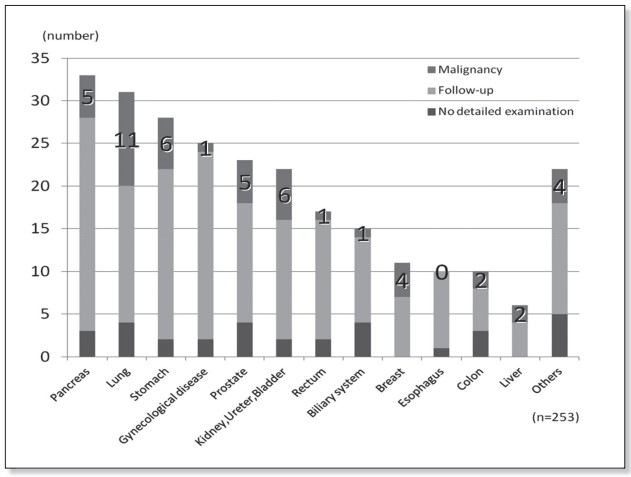

Fig.6-1 Details of "other parts" results of CT scans

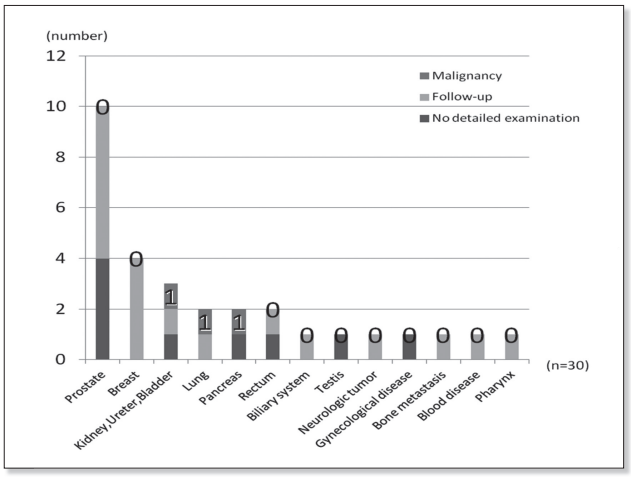

Fig.6-2 Details of "other parts" results of MRI examinations

Fig.6 Details of "other parts" of CT and MRI results

quired follow-up, as the next scheduled examination was 2 months later. The date of the consultation was moved forward, and treatment was initiated more than 1 month ahead of schedule.

For "other sites," Fig.6 shows the distribution of the indicated sites. The number of cases for each indicated site is divided into cases in which a detailed examination was conducted and "malignancy" was consequently diagnosed, and cases in which "follow-up", and cases in which "no detailed examination" was performed. The numbers at the top of each bar in the graph represent the number of cases diagnosed as malignant.

5. Discussion

Our hospital initiated a system to follow up reports of radiographic interpretations and avoid delayed responses to reports received from the remote diagnostic reading doctor. The present study demonstrated that follow-up was required for 4% of all CT scans and 1% of all MRI scans for which radiographic interpretation by the remote diagnostic reading doctor was requested. Follow-up was required for approximately 13 CT scans per month, which is a fairly high number. Of all departments, the department of urology requested the second-highest number of tests that required follow-up in CT, after the department of surgery, and the highest number of tests requiring follow-up in MRI. These results reflect the numbers of patients examined by each department and the characteristically high number of MRI scans requested by the department of urology at our hospital.

More than 70% of cases requiring follow-up received the necessary treatment; this result suggests the importance of follow-up. In most of the remaining nearly 30% of cases, the reasons follow-up treatment was not performed included: follow-up treatment had already been performed at another hospital or department, treatment of another illness was a priority, or the patient did not wish to undergo a detailed examination or treatment.

When testing reveals super-acute findings, the on-site diagnostic radiologist and the attending physician are contacted immediately to administer the necessary treatment. In the present study, follow-up was required for 24 "acute phase" cases and 1 "infectious disease" case. Reading interpretation reports for follow-up is considered to help improve interpretation accuracy. In addition, effort should be made to respond to acute findings in testing.

As suitable follow-up enables early initiation of treatment and diagnosis of malignancy, we believe our follow-up system has sufficiently contributed to mitigation of the delays and oversights in the treatment of cases that require follow-up. However, the following issues must be addressed: 1) differences in standards for objects of follow-up according to the radiological technologist who checks the radiograph interpretation and 2) standardization of the content to be followed up to prevent unnecessary increases in workload that result from relatively minor findings.

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The Employment Environment of Radiological Technologists

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Key words: Starting salary, Demand and supply, Radiological Technologists, Job postings

【Summary】
This study aimed to clarify the wage differences among Radiological Technologists (RTs) based on the type of employment, payroll system, school career, area (prefecture), and other characteristics. The demand for RTs, especially for female RTs, has been increasing steadily. However, the supply of RTs is increasing more rapidly because the number of schools providing RT education has increased substantially. It is clear that we should take this research further in order to provide appropriate guidelines for the employment of RTs.

1. Background and purpose

Recently, there have been advancements in healthcare, and many complications need to be addressed. Additionally, there have been changes in the medical needs of the public. Therefore, there have been attempts to enhance "team healthcare delivery" that is performed by various medical staffs who cooperate with and complement each other to maximally practice their specialty. As a result, the scope of work of radiological technologists (RTs) has also increased[1), 2), 3), 4)]. RTs are being educated in educational institutions such as a four-year university, which accounts for approximately 70% of all of institutions offering such courses. Given that the establishment of new schools for RTs has been promoted in recent years, a corresponding increase in the number of students who go to schools to become an RT is expected.

Meanwhile, one of the current problems is the lack or uneven distribution of medical staff across the country. The Japan Medical Association Committee has formulated measures[5)] to correct the lack or uneven distribution of physicians. The estimated number of nurses by 2025 is also expected to be insufficient according to a report[6)] presented in the conference for the seventh projection of the estimated supply and demand of nursing personnel by the Ministry of Health, Labour and Welfare (MHLW) of Japan. The Japanese Nursing Association continuously conducts surveys to understand the supply and demand or the work situation of hospital nurses as well as to enable the retention of the nurses[7)]. However, although some reports on the supply and demand for RTs have been presented[8), 9), 10), 11)], no studies have focused on RTs' starting salary, condition of female utilization, or educational background.

We therefore aimed to investigate the current status of the supply and demand and working conditions of RTs taking into account regional differences, as well as discussing the prediction of the supply and demand for RTs, and the general future prospects. We also discussed the challenges to the realization of a stable supply and demand of RTs and to improve the treatment of RTs.

2. Subjects and methods

The present study was conducted on 707 job postings that were sent from medical institutions to the Suzuka University of Medical Science from April 1, 2015 to March 31, 2016. Two job postings were also sent from non-medical institutions, which were excluded from the present study.

The following 10 items were investigated: ①receipt date of the job posting, ②location of institution (prefecture), ③category of institution (hospital, clinic, or others [for medical check-up]), ④employment pattern (full time, part time, fixed term, etc.), ⑤conditions of attempting the employment of women (women only or preferred), ⑥restriction of application according to educational background, ⑦differentiated starting salary according to educational background, ⑧payroll system (monthly salary, annual salary, etc.), ⑨base salary, and ⑩qualification allowance or extra allowance, etc. (including the fixed amount of allowance given to those who have an RT license, excluding age-based salary, cold-district allowance, district allowance, family allowance, home allowance, attendance bonus, commuting allowance, overtime compensation, night allowance, holiday allowance, etc.).

The above results were analyzed to examine the following aspects: ①employment overview, ②requirements for employment (enhanced utilization of women), ③requirements for employment (educational background), ④employment pattern, ⑤salary by payroll system, ⑥starting salary by educational background, and ⑦starting salary by region. Subsequently, we identified the number of examinees taking the national examination for RTs from fiscal year 2006 to 2015, as well as the pass rate, to support the discussion on the supply and demand for RTs. Based on the findings, the outcomes of various statistical surveys conducted by the MHLW, the Ministry of Internal Affairs and Communications, or the professional associations of physicians, nurses, and others were examined. In addition, during the period of the present study, opinions were exchanged with managerial or female RTs working in medical institutions. The results of this study were reported in the 32nd Japan Conference of Radiological Technologists (academic conference of the Japan Society for the Education of Radiological Technologists), where views were exchanged with the conference participants.

Facilities which did not clearly state parts of the items, such as their starting salary or requirements for employment, were excluded from each analysis.

Statistical processing was performed using IBM SPSS Statistics Ver.22, which included basic descriptive statistics, a homogeneity analysis, the Mann-Whitney U test, and the Kruskal-Wallis test.

3. Results

3-1 The conditions of the demand for RTs

3-1-1 Number of job recruitments

The number of monthly job recruitments in fiscal year 2015 has been shown in Fig.1. In April, 32 job postings were sent, and they increased thereafter, peaking at 113 in July. The number started to decrease from August and remained in the 50s to 60s from September to December, again decreasing to less than 50 af-

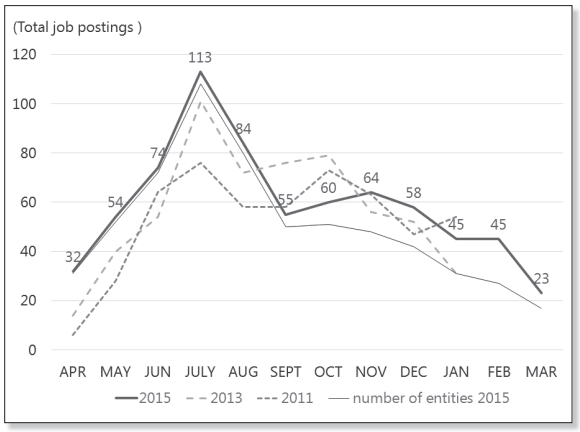

Fig.1 Total number of job postings/month

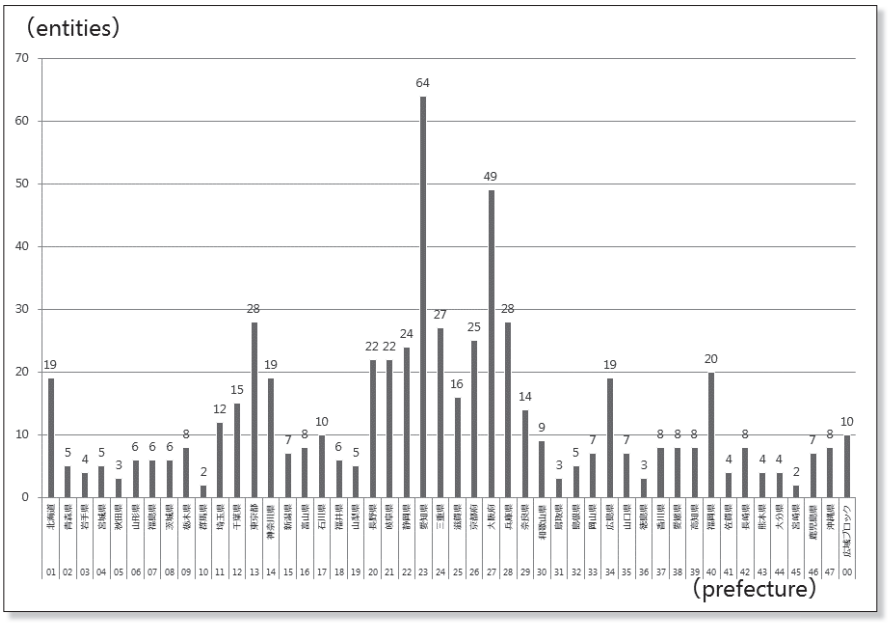

Fig.2 Number of entities of job postings

ter January. As illustrated in Fig.1, a line graph (thin solid line) was added to represent the number that excluded the overlapping of job recruitment caused by obvious "additional recruitments." The graph added then revealed that the job postings increased owing to the additional recruitments in the latter half of the year. After the exclusion of the overlaps, the total number of job recruitments was 609. The dashed line shown in the figure represents the number of monthly job openings in fiscal year 2011 and 2013 according to the report by Muto[8]. Since previous studies did not include the data for the last 2 months of these fiscal years, the data for both years could not be compared. However, the total number of job openings was larger in 2015 than in 2011, with the increased job openings in 2015 noted from April to August.

The job postings sent were then categorized by prefecture, as shown in Fig.2. In the present study, job postings were sent from all 47 prefectures in Japan, and they could be included in the analysis. Many of them were sent from the Tokai and Kinki regions, or the areas around Tokyo, but some postings were also received from the Hokkaido, Kanagawa, Hiroshima, and Fukuoka prefectures, which contain the metropolitan areas with a large population.

3-1-2 Promotion of attempts to employ women

The job postings were checked for descriptions such as "recruitment of women" or "enhanced utilization of women." The results showed that only 36 facilities (5.9%) specified their conditions for the enhancement of female RT utilization, such as "women are preferred to address the mammography service" or "women candidates preferred." Other 573 facilities (94.1%) described no specific conditions.

3-1-3 Requirements for employment based on educational background and payroll system

Since approximately 70% of the 45 training schools for RTs are universities as of 2016 (excluding the Institute of Medical Radiology Technologists at the Japan Self-Defense Forces Central Hospital), most new RTs had a university degree. The job postings were checked for restrictions on employment and differentiation of the payroll system by educational background. A total of 64 facilities (10.5%) stated

that students with a bachelor's degree (hereafter, referred to as bachelor's graduates) or higher education were eligible to apply, and 2 of them (0.3%) specified the distinction of the payroll system between bachelor's and master's graduates. Further, 239 facilities (39.2%) did not differentiate their requirements for employment but they specified the differentiation of their payroll system by educational background. Finally, 306 (50.2%) facilities specified no particular differentiation.

According to the type of facility (hospital, clinic, others [for medical check-up]), 60 (11.2%) of the 290 hospitals (54.3%) specified that they wished to employ students with a bachelor's degree or higher education, and 230 hospitals (43.0%) specified the distinction of the base salary. Meanwhile, most of the clinics (30 [88.2%]) and health check facilities (32 [78.0%]) did not differentiate the employment requirements or salary package.

3-1-4 Employment pattern (full time, fixed term, part time, etc.)

The employment pattern of RTs included permanent full-time staff (579 facilities [95.7%]), fixed-term staff (20 [3.3%]), and part-time staff (10 [1.6%]). This indicates that more than 95% of RTs were currently employed as permanent full-time staff. However, approximately 5% were employed as fixed-term or part-time staff, who were particularly employed in facilities such as university or prefectural hospitals.

3-2 Conditions of the supply of RTs (the number of examinees and pass rate for the national examination for RTs)

To discuss the conditions of RT supply, the changes in the number of examinees appearing for the national examination for RTs after fiscal year 2006[12] was examined (Fig.3). In 2006, the number of examinees was 2,821, which decreased to the 2,400s during 2007 to 2012. Due to the establishment of new training institutions for RTs, in 2013, the number increased by approximately 500, to 2,907, and it crossed 3,000 in 2015. In addition, if the increase in the number of examinees would be equivalent to the student quota of these new institutions (2 schools were established in 2013 and 2 in 2014) in 2016 and 2017, the number would have increased by more than 100 each year. Thus, 3,236 and 3,346 examinees are expected to take the examination in 2016 and 2017, respectively, indicating an approximately 1.3 times larger number of examinees than that 10 years ago.

The pass rates of the national examination for RTs after fiscal year 2006 have been illustrated in Fig.4. Though the rate varied depending on each year's examination in the last 10 years, it remained 75% on an average. Thus, if

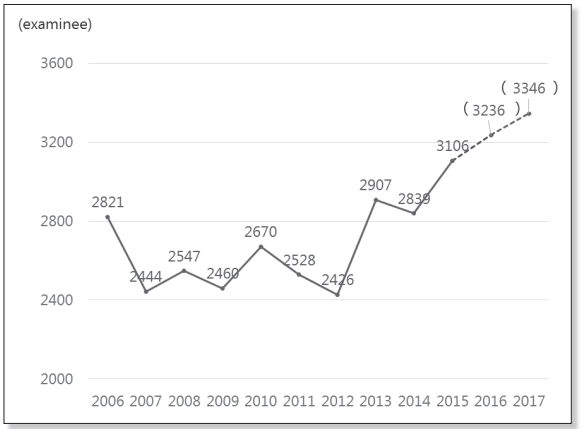

Fig.3 Number of examinees

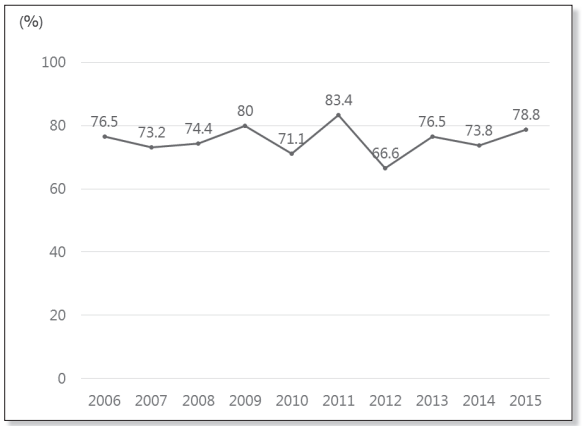

Fig.4 Pass rate for RT national examination

the rate would remain at similar percentages, the number of those who obtain an RT license is estimated to increase in proportion to the increase in the number of examinees.

3-3 Conditions of treatment of RTs

3-3-1 Salaries by payroll system (base salary, starting salary)

Among the 609 facilities investigated, 585 (96.0%) stated their salary on the job posting. The payroll system for RTs in those facilities included monthly salary (576 facilities [98.5%]), annual salary (3 [0.5%]), and daily salary (6 [1.0%]). The facilities adopting a daily payroll system were recruiting part-time staff or fixed-term full-time staff. Subsequent analyses were performed on the facilities adopting a monthly payroll system.

A comparison of base salaries by payroll system (excluding qualification allowance or extra allowance) has been presented in Table 1. In the case of facilities offering different salaries according to educational background, the salary for bachelor's graduates was utilized for the analysis.

The base salary in the facilities adopting a monthly payroll system was 188,934 yen on an average, the median was 187,075 yen, the minimum was 100,000 yen, and the maximum was 280,000 yen. The base salary in the facilities adopting a daily payroll system was 8,780 yen on an average, the median was 8,807 yen, the minimum was 7,804 yen, and the maximum was 9,600 yen. The base salary in those adopting an annual payroll system was 3,521,393 yen on an average, the median was 3,564,180 yen, the minimum was 3,400,000 yen, and the maximum was 3,600,000 yen. The base salary in facilities adopting the monthly payroll system in the present study was lower than that reported in the 2013 survey results[8] by 0.05% on an average and by 0.7% according to the median, with no statistically significant differences.

The starting salary calculated by the addition of extra allowance to the base salary has been shown in Table 2. The starting salary in the facilities adopting a monthly payroll system was 201,602 yen on an average, the median was 198,330 yen, the minimum was 108,300 yen, and the maximum was 301,600 yen. The starting salary in the daily and annual payroll systems was the same as the base salary. The starting salary in the monthly payroll system in the present study was lower than that reported in the 2013 survey results[8] by 0.3% on an average and by 0.5% according to the median, with no statistically significant differences.

3-3-2 Salaries by educational background (starting salary)

A comparison of the starting salary by educa-

Table 1 Base salary for new graduates by the payroll system for 2015 versus that for 2013

	payroll system	monthly	daily	annual
number of entities		576(539)	6(9)	3(4)
salary	average	¥188,934(¥189,029)	¥8,780(¥9,689)	¥3,521,393(¥3,205,200)
	median	¥187,075(¥188,410)	¥8,807(¥9,456)	¥3,564,180(¥3,134,400)
	S.D.	¥19,251(¥18,430)	¥701(¥1,141)	¥106,644(¥277,139)
	minimum	¥100,000(¥131,400)	¥7,804(¥8,280)	¥3,400,000(¥2,952,000)
	maximum	¥280,000(¥306,400)	¥9,600(¥12,000)	¥3,600,000(¥3,600,000)

w/o qualification allowance

Table 2 Starting salary for new graduates by the payroll system for 2015 versus that for 2013

	payroll system	monthly	daily	annual
number of entities		576(539)	6(9)	3(4)
salary	average	¥201,602(¥200,954)	¥8,780(¥9,689)	¥3,521,393(¥3,205,20)
	median	¥198,330(¥197,400)	¥8,807(¥9,456)	¥3,564,180(¥3,134,40)
	S.D.	¥19,987(¥19,000)	¥701(¥1,141)	¥106,644(¥277,139)
	minimum	¥108,300(¥156,000)	¥7,804(¥8,280)	¥3,400,000(¥2,952,00)
	maximum	¥301,600(¥312,500)	¥9,600(¥12,000)	¥3,600,000(¥3,600,00)

w/o qualification allowance

Table 3 Differences in starting salary for new graduates by degree

	Degree required	bachelor	bachelor	non	non	non	non
	Credential	master	bachelor	master	bachelor	diploma	not vary by credential
number of entities		2	64	14	239	239	273
salary	average	¥213,270	¥204,635	¥208,006	¥195,959	¥186,503	¥205,829
	median	¥213,270	¥204,066	¥204,250	¥194,200	¥184,500	¥202,176
	S.D.	¥20,548	¥15,249	¥14,200	¥14,902	¥13,664	¥23,414
	minimum	¥198,740	¥175,000	¥191,300	¥108,300	¥161,400	¥140,000
	maximum	¥227,800	¥245,400	¥232,800	¥268,900	¥231,300	¥301,600

tional background has been shown in Table 3. The starting salary for 64 facilities that stated in the requirements for application that they would employ students with a bachelor's degree or higher education was 204,635 yen on an average, the median was 204,066 yen, the minimum was 175,000 yen, and the maximum was 245,400 yen. Among these facilities, 2 specified a differentiation in the starting salary for master's graduates, with an average salary of 213,270 yen. For the 239 facilities that did not specify the educational background for application but differentiated the starting salary based on educational status, the starting salary for bachelor's graduates was 195,959 yen on an average, the median was 194,200 yen, the minimum was 108,300 yen, and the maximum was 268,900 yen. The starting salary for professional school graduates was 186,503 yen on an average, the median was 184,500 yen, the minimum was 161,400 yen, and the maximum was 231,300 yen. Among these facilities, 14 described the starting salary for master's graduate, offering 208,006 yen on an average, with a median of 204,250 yen, a minimum of 191,300 yen, and a maximum of 232,800 yen. For facilities which did not particularly limit recruitment or differentiate the base salary according to educational background, the starting salary was 205,829 yen on an average, the median was 202,176 yen, the minimum was 140,000 yen, and the maximum was 301,600 yen.

In terms of statistical analysis, there was little data on master's graduates; therefore, they were excluded from the analysis.

The results indicated that the starting salary for professional school graduates in facilities differentiating the payroll system by educational status was lower than that in any other groups ($P < 0.05$). The starting salary for bachelor's graduates in the group of facilities differentiating the payroll system according to education was lower than that in the group of facilities that required a bachelor's degree for application or those which made no differentiation ($P < 0.05$). The facilities with different payroll systems for bachelor's graduates and professional school graduates differentiated the base salary for both graduate groups, with a lower starting salary for professional school graduates than for bachelor's graduates.

3-3-3 Salaries by prefecture (base salary, starting salary)

The starting salary for newly graduated RTs by prefecture has been shown in Fig.5 and Table 4. In addition to the average starting salary for each of the 47 prefectures, the ones in facilities employing graduates in wide-area blocks, such as National Hospital Organization, as well as the national average, have been presented. For the calculation of the average starting salary in "facilities offering a different salary for bachelor's graduates," the starting salary for

Table 4 Summary of the starting salary difference by area

ISO JP code	Prefecture "Japanese"	Average of RT's basic saraly	Average of RT's starting saraly	Average of Medical and Welfare(bachelor)
01	北海道	¥192,577	¥198,803	¥220,100
02	青森県	¥189,300	¥195,967	¥164,800
03	岩手県	¥180,050	¥180,050	¥158,600
04	宮城県	¥186,320	¥197,220	¥211,500
05	秋田県	¥188,050	¥189,700	¥162,600
06	山形県	¥204,720	¥209,520	¥190,500
07	福島県	¥190,370	¥222,160	¥184,600
08	茨城県	¥192,667	¥216,300	¥207,700
09	栃木県	¥191,263	¥196,263	¥181,900
10	群馬県	¥178,850	¥193,850	¥198,700
11	埼玉県	¥199,838	¥205,622	¥195,000
12	千葉県	¥192,295	¥199,656	¥207,900
13	東京都	¥196,596	¥210,898	¥205,400
14	神奈川県	¥201,996	¥210,014	¥208,200
15	新潟県	¥180,384	¥187,051	¥166,900
16	富山県	¥174,803	¥184,489	¥168,000
17	石川県	¥181,975	¥189,475	¥192,800
18	福井県	¥179,817	¥183,483	¥195,200
19	山梨県	¥196,465	¥217,265	¥165,100
20	長野県	¥188,736	¥191,780	¥169,500
21	岐阜県	¥179,098	¥190,383	¥194,300
22	静岡県	¥187,403	¥202,555	¥204,100
23	愛知県	¥194,257	¥210,355	¥207,000
24	三重県	¥189,653	¥203,327	¥196,200
25	滋賀県	¥187,574	¥198,574	¥192,200
26	京都府	¥185,577	¥196,472	¥188,100
27	大阪府	¥191,536	¥202,902	¥200,100
28	兵庫県	¥190,780	¥207,196	¥195,200
29	奈良県	¥191,057	¥201,429	¥191,000
30	和歌山県	¥188,400	¥195,543	¥214,200
31	鳥取県	¥183,900	¥183,900	¥170,000
32	島根県	¥184,501	¥191,201	¥185,800
33	岡山県	¥182,043	¥198,471	¥194,600
34	広島県	¥187,089	¥206,647	¥202,600
35	山口県	¥189,400	¥198,417	¥177,700
36	徳島県	¥186,333	¥234,667	¥171,100
37	香川県	¥198,342	¥202,467	¥181,600
38	愛媛県	¥178,813	¥191,863	¥172,400
39	高知県	¥179,406	¥195,656	¥215,800
40	福岡県	¥182,859	¥206,042	¥174,200
41	佐賀県	¥176,333	¥199,667	¥184,000
42	長崎県	¥183,202	¥203,702	¥207,900
43	熊本県	¥163,650	¥163,650	¥218,500
44	大分県	¥185,533	¥218,533	¥171,700
45	宮崎県	¥166,200	¥196,200	¥160,000
46	鹿児島県	¥186,308	¥193,058	¥187,500
47	沖縄県	¥178,700	¥201,900	¥184,300
00	広域ブロック	¥180,260	¥188,060	–
JP	全国平均	¥189,267	¥201,602	¥199,000

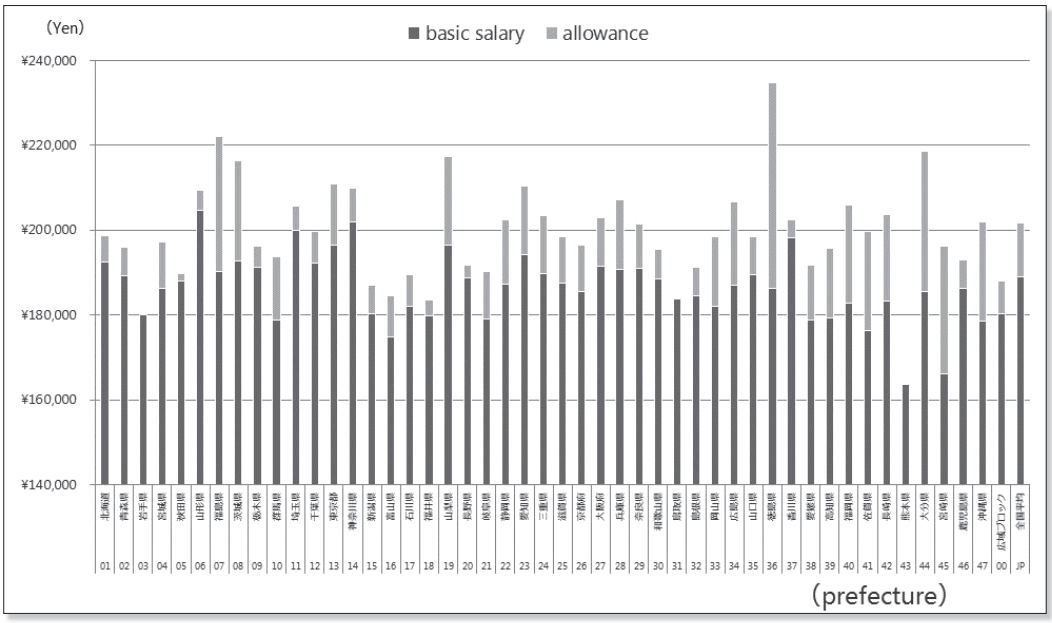

Fig.5　Summary of the starting salary difference by area

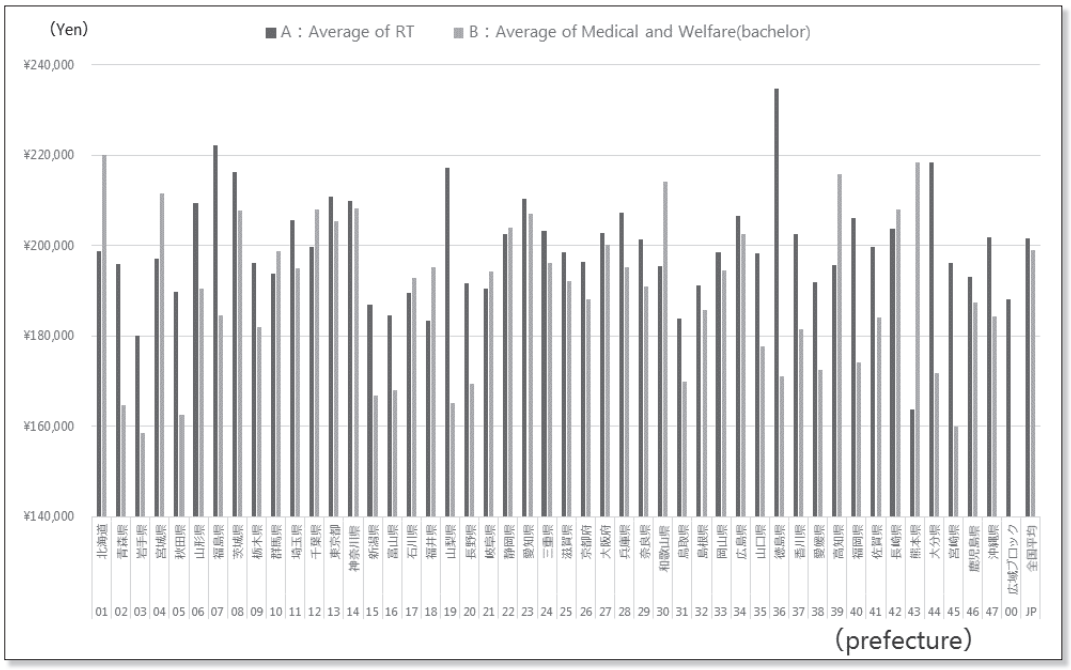

Fig.6　Summary of the starting salary difference by area

bachelor's graduates was used. Facilities with an annual or a daily payroll system were excluded from the analysis. The bar graphs in Fig.5 represent the starting salary calculated by adding qualification allowance and extra allowance to the base salary.

The names of the prefectures have been presented in Japanese, with the prefecture identification numbers defined by ISO 3166-2: JP (in this report, the wide-area blocks and the national average are 00 and JP, respectively).

In addition, the starting salary for RTs in the present study have been presented in Table 4 and Fig.6, along with the survey results of the

starting salary for the job types (medical and welfare professions [excluding physician and nurse]) reported in "the 2015 Basic Survey on Wage Structure (starting salary)[13]" conducted by the MHLW (hereafter, referred to as the 2015 MHLW Wage Survey [medical and welfare]). The Basic Survey on Wage Structure is conducted annually to reveal the actual wages by the employment pattern of workers in the major industries nationwide. The starting salary reported by the Basic Survey on Wage Structure is calculated by subtracting commuting allowance from a given salary (consisting of base salary and other allowances without overtime compensation) for new graduates completing regular duties, representing the addition of the various allowances to the results of the present research.

The base salary for newly graduated RTs by prefecture in this investigation ranged from 174,803 yen to 204,200 yen, with a difference of approximately 29,000 yen (prefectures with 5 or less job postings that met the requirements were excluded). The starting salary ranged from 184,489 yen to 209,520 yen, showing a difference of approximately 25,000 yen by prefecture. For 47 prefectures, the starting salary of newly graduated RTs below the national average is represented by the shaded area in Fig.4. Further, 19 prefectures had a starting salary above the national average.

The starting salary in the results of the 2015 MHLW Wage Survey (medical and welfare) was 199,000 on an average, ranging from 160,000 yen to 220,100 yen, with a maximum difference of 60,100 yen[12]. According to the 2015 MHLW Wage Survey, the starting salary exceeded the national average only in 14 prefectures.

A comparison of the starting salary in each prefecture between RTs and the results of the 2015 MHLW Wage Survey (medical and welfare) revealed a higher starting salary for RTs in as many as 35 prefectures as compared to the results of the MHLW survey.

4. Discussion

The Vital Statistics reported by the MHLW[14] revealed that the population aged 80 years or older would increase by 4.9 million (by 60%) from 8.2 million in 2010 to 13.1 million in 2030. According to the 2016 Annual Report on the Aging Society by the Cabinet Office of Japan[15], the rate of the elderly aged 65 years or older who had any complaints (the number of those who had any subjective symptoms of disease or injury in the latest days per 1,000 population [excluding inpatients]) was 466.1 in 2013, representing nearly half of the people complaining of any subjective symptoms. Further, 258.2 individuals' disease or injury affected their daily life, which accounted for almost a half of those complaining of any subjective symptoms. In this period of total population decline, the rate of population aging is increasing, with the elderly population having reached 33.92 million in 2015 and expected to peak at 38.78 million in 2042. That is to say, the demand for healthcare professionals, including nurses who support the elderly aged 80 years or older prone to disease or injury, is expected to increase in the coming 20 years.

The number of job postings examined in the current study will be compared to those included in a 2011 study. The last 2 months in fiscal year 2011 were not investigated and were excluded from this comparison. The job postings of the same period were compared, and they demonstrated an increase by 20.8% from 527 job postings in 2011 to 637 in 2015. In addition, the job postings were sent from the beginning of fiscal year 2015, with 95% of them intending to recruit RTs as permanent full-time staff. This indicates a steady demand for RTs as of the time of this report. Meanwhile, 5% of the facilities were recruiting RTs as fixed-term or part-time staff. This suggests that despite the demand for RTs, detailed and continuous investigation will be needed hereafter on these types of employment patterns, taking into ac-

count the possibilities of influences of the financial condition of hospitals or changes in strategy for treating RTs. Subsequently, we examined if the facilities stated the employment requirements and differentiated the payroll system by educational background. The results showed that 10% of the facilities specified the requirements for recruitment and they preferred graduates with a bachelor's degree or higher education, and 40% of them introduced a payroll system according to educational status. Further, 3% of the facilities set a starting salary for master's graduates in their payroll systems. These findings suggest that the demand for newly graduated RTs with higher education could increase in the future.

The present study revealed that only 6% of all the facilities specified the enhanced utilization of female RTs in the requirements for application in the job postings. The rate was almost the same as the results[8] we previously reported. The MHLW recommends that, in the presence of different treatment of female and male workers, such as few women at a workplace or the majority of management positions being occupied by men, the workplace should engage in "positive action". This entails the implementation of active measures necessary to realize equal treatment between men and women, and specifically, for example, it is performed by adding a message from senior female RTs in job postings or recruiting female RTs. Additionally, despite the absence of discriminatory treatment between men and women in their in-company systems, some workplaces could be facing problems such as "having few women in the occupational field," "little increase in female managers," and thus, achieving "insufficient utilization of females' capabilities." In such cases, "positive action" appears to be necessary to realize the equal treatment of men and women, and clearly stating that it does not violate the Equal Employment Opportunity Law[8), 16)]. During the present study period, we had opportunities to exchange views with persons in charge of medical institutions that were recruiting employees. On multiple occasions, we heard them commenting that they did not know about the "positive action" of their institution, and assumed that they must not specify the recruitment of women in job postings. We obtained similar comments when we reported the results of this study in the 32nd Japan Conference of Radiological Technologists (academic conference of the Japan Society for the Education of Radiological Technologists) and exchanged opinions with the conference participants. Although they provided free comments verbally, it was inferred that employees in actual workplaces might not be currently kept informed about the company's "positive action". Considering the high demand for RTs at the time of the present study, facilities lacking female RTs are particularly recommended to promote "positive action" in recruitment, which would enable employers to understand the exact demands of the position and to prevent a mismatch with applicants.

As an investigation of supply and demand for RTs, the conditions of treating RTs were analyzed according to their starting salary. A field survey of RTs' salary was also conducted by the Japan Association of Radiological Technologists, and the results allow for the tracking of annual changes in salary, representing valuable data to examine the balance of supply and demand for RTs, as well as to understand its background conditions related to the medical economy in Japan[8), 17)]. In the present study, educational background and female utilization were added to the analysis, to investigate the supply and demand for RTs and to discuss the challenges to the improvement of the treatment of RTs.

The average starting salary of newly graduated RTs was as follows: 204,635 yen for bachelor's graduates in facilities recruiting only graduates with bachelor's degree or higher education, 195,959 yen for bachelor's graduates and

186,503 yen for professional school graduates in facilities differentiating their payroll system by educational background, and 205,829 yen for bachelor's graduates in facilities not differentiating their payroll system by education. The starting salary reported in the 2015 MHLW Wage Survey (medical and welfare) was 199,000 yen, which is lower than the present salary of RTs, which indicates that they currently receive relatively favorable treatment.

However, the starting salary in the 2015 MHLW Wage Survey (medical and welfare) was higher than that reported in a similar survey conducted in 2013. Specifically, it was higher by 3.2% for bachelor's graduates (addition of female and male salaries) and by 2.7% for junior college and professional school graduates. Meanwhile, the starting salary for RTs in 2015 was higher than that in 2013 by 0.3% (addition of the results for all educational statuses) and by 0.9% in facilities not differentiating their payroll system and employment requirements by educational status, and lower by 4.8% in facilities recruiting only graduates with bachelor's degree or higher education. These results imply almost no changes in the starting salary of newly graduated RTs as a whole, as compared with the increases in the starting salary of other healthcare personnel. In terms of the current conditions of other kinds of occupations, a survey of the supply and demand for hospital nurses was conducted by the Japanese Nursing Association. The results of the survey similarly reported that the starting salary for newly graduated nurses had undergone little change in the past 5 years, and that the salary for nurses might not reflect the increased salary resulting from medical fee revisions[7]. These findings emphasized the need for paying attention to future changes in the policy for the treatment of nurses, including the issue of salary.

The regional supply and demand for RTs was analyzed in terms of starting salary, which showed regional differences in the starting salary by approximately 25,000 yen. The starting salary for RTs in each prefecture were compared to the results of the 2015 MHLW Wage Survey (bachelor's graduates), which revealed that the present figures exceeded those reported in the 2015 MHLW Wage Survey (medical and welfare) in as many as 35 prefectures. This may indicate a strong demand and favorable treatment of RTs at the time of this report, particularly in rural prefectures.

As far as the supply of RTs is concerned, the number of examinees taking the national examination for RTs had remained approximately 2,500 until 5 years ago, but it has been increasing significantly in recent years. The pass rate for this examination has been around 75%, and if the rate remains at similar levels in the future, the number of newly licensed RTs is expected to increase to over 2,500 in fiscal year 2017, while it remained about 1,800 from 2007 to 2012. That is to say, the number of RTs supplied would increase on a short-term basis and it is expected to decrease in the long term due to the declining birth rate of the country.

As the environment for healthcare professionals becomes harsher, Kodama et al.[9], predicted a future decrease in the demand for RTs. Shibuya also pointed out that the starting salary for RTs was lower than that for nurses, and less than 50% of the facilities differentiated their starting salary based on educational background. He thus expressed concern that talented personnel might be no longer supplied to real medical settings in the future unless the current conditions were improved immediately[10, 11]. The results of the current study showed that 10% of the facilities required newly graduated RTs to have completed a bachelor's degree or higher education, and 40% of them offered a starting salary that differed according to educational background. Further, 3% of the facilities differentiated the starting salary for master's graduates. However, the treatment of bachelor's graduates is still suboptimal, and it needs to be improved.

In order to ensure stable supply and demand, promotion of "positive action" is indispensable as women's medical radiology technologists increase.In addition to efforts to prevent mismatches at the time of employment, in order to continue employment while raising children and care, we introduced measures such as short-time work regular employee system, efforts towards working hours management, by taking measures to deal with diverse ways of working, it will lead to the stable supply and demand of RTs. These measures would allow employees with children or those involved in caregiving to continuously work at the same workplace. This would simultaneously facilitate the provision of safe and secure high-quality medical care. To ensure a stable supply and demand for RTs in the future, the demand (medical institutions) and supply (training institutions) institutions need to cooperate to appropriately improve information sharing about employment conditions. In addition, given that Japan is set to face a population decline hereafter, it is necessary to promote measures to retain RTs by cooperating widely with the central government; local governments; and founders of hospitals, clinics, and healthcare centers.

The long-term estimation of the future supply and demand for RTs is considered uncertain and it may vary depending on the social situations of the time, such as government policies or business conditions. If the healthcare delivery system largely changes hereafter, the new prospects of the supply and demand for RTs will need to be discussed. The results of the present study can be used as reference materials for discussions on future retention of RTs.

Additionally, in future, a more accurate prospect of the supply and demand should be formulated, and for this purpose, it is necessary to create methods to understand the actual demand for RTs. For example, it would be appropriate to conduct a nationwide survey of chief RTs on the turnover rate of full-time or newly graduated staff, starting salary for newly graduated employees, salary for staff with an experience of 10 years, the retirement system or the extension of the retirement system, and the status of introducing a continuous employment system. We propose that similar surveys on the supply and demand for RTs be conducted regularly by the Japan Association of Radiological Technologists, in cooperation with the Japan Society of Education for Radiological Technologists.

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5. Conclusion

This study revealed the current conditions of demand for RTs and analyzed the situation of RTs in specific regions. The level of demand and salary for RTs seemed to remain steady at the time of this report. Further, it was observed that despite the demand for female RTs, the need was not met sufficiently. The supply of RTs has been estimated to increase on a short-term basis. To realize a stable supply and demand for RTs in the future, it is necessary to promote the "positive action" in recruitment as well as to provide support to allow RTs to work continuously at their current workplace or to have an opportunity to be employed again. Additionally, surveys on the conditions of supply and demand or treatment of RTs, including the issue of salary, need to be conducted continuously hereafter.

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