

Report

# Creative Approach to Internal Staff Training in Radiation Emergency Medicine at Hirosaki University Advanced Radiation Emergency Medical Support Center

Takakiyo Tsujiguchi<sup>1, 2)†</sup>, Tomoki Koiwa<sup>1, 2)†</sup>, Junko Mikami<sup>2, 3)</sup>,  
Chieko Itaki<sup>1, 2)</sup> and Katsuhiro Ito<sup>2, 3)\*</sup>

<sup>1</sup>Hirosaki University Graduate School of Health Sciences, 66-1 Hon-cho, Hirosaki 036-8564

<sup>2</sup>Hirosaki University Center for Radiation Support and Safety, 66-1 Hon-cho, Hirosaki 036-8564

<sup>3</sup>Advance Emergency and Critical Care Center, Hirosaki University Hospital, 5 Zaifu-cho Hirosaki 036-8562

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The impact of COVID-19 has hampered participative training over the last few years at the Advanced Radiation Emergency Medical Support Center and Nuclear Emergency Core Hospital. Therefore, the Advanced Radiation Emergency Medical Support Center at the Hirosaki University has introduced e-learning since 2020. Monthly notifications of e-learning opportunities were sent to each department. According to a survey regarding internal training completion rate in radiation emergency medicine since the start of the training program, as of March 2021, 89.3% of all Hirosaki University Hospital employees have already completed training. Thus, human resource development in the hospital had progressed steadily; including training in 2020, when e-learning was introduced. This indicates that e-learning effectively promotes participation. In addition, detailed notifications about events were provided to each department, which was effective in raising awareness among staff and improving attendance. In this paper, we report the details of our training program through e-learning.

*Key words:* Advanced Radiation Emergency Medical Support Center, Nuclear Emergency Core Hospitals, radiation emergency medicine, education

## 1. Introduction

The Fukushima Daiichi Nuclear Power Plant accident caused by the 2011 earthquake off the Pacific coast of Tohoku prompted a review of the nuclear disaster response system, and the Nuclear Regulation Authority (NRA) Japan formulated the “Nuclear Emergency

Response Guidelines” in October 2012<sup>1)</sup>. Subsequently, major revisions were made in 2015 regarding the radiation emergency medical care system, resulting in the establishment of the current system. In the revised radiation emergency medical care system, Nuclear Emergency Core Hospitals (NECH) and Advanced Radiation Emergency Medical Support Centers (AREMSC) play a central role in dealing with exposed/contaminated patients. In addition, a system that can respond to emergency medical needs in the acute phase of a nuclear disaster needs to be established. It is essential to provide professional training to medical personnel and technicians related to emergency medical care and

\*Katsuhiro Ito: Advance Emergency and Critical Care Center, Hirosaki University Hospital, 5 Zaifu-cho Hirosaki 036-8562

E-mail: itohkck@nifty.com

†These authors have an equivalent contribution to that of the first author.

**Table 1.** Details of in-house staff training program regarding radiation emergency medicine at Hirosaki University

No	Educational goals	Content details	Time (min)
1	Understand the role of the university in a nuclear disaster	Nuclear emergency response system in Japan, including guidelines on dealing with a nuclear emergency; the roles of Nuclear Emergency Core Hospitals and Advanced Radiation Emergency Medical Support Centers	20
2	Understanding the basics of radiation	Radiation units, protection principles, and biological effects	20
3	Understand the medical equipment and supplies for radiation emergency medicine in Hirosaki University Hospital	Introducing medical equipment of radiation emergency medicine owned by Hirosaki University Hospital's emergency room such as whole-body counters, curing materials, survey meters, etc.	20

radiation to ensure NECH and AREMSC's effective responses in a radiation emergency. In particular, it is essential to train all staff of own institution regarding radiation emergency medicine (in-house REM training) to promote understanding of the role of the facility, ensuring the correct responses during a disaster<sup>2,3</sup>. In the "Facility Requirements for Base Hospitals for Nuclear Emergency Preparedness" stipulated by NRA Japan<sup>4</sup>, NECH and AREMSC are obliged to "in principle, conduct regular education and training for all staff at their facilities." In addition to staff training in their field of specialization, they should also know their facility's role and the basic principles of radiation.

However, as it is difficult to compile training material and inform all staff of the training, few NECH and AREMSC can provide sufficient training<sup>5</sup>. To provide smooth medical care in a radiation emergency, the continuous development of human resources is essential. Thus, in-house REM training must be continued, even during the COVID-19 pandemic. In April 2020, Hirosaki University initiated a new training system to continuously present in-house REM training through e-learning. This paper describes the content and dissemination methods of the regular in-house REM training on medical care in the event of a nuclear disaster at Hirosaki University. It also provides examples of efforts to improve staff participation and data on the completion rate in the newly launched in-house REM training using e-learning.

## 2. Methods

### 2.1. Compiling the training content

When planning in-house REM training, all employees are targeted. Consequently, setting educational goals and creating content is challenging. Hirosaki University has set three educational goals for in-house REM training and uses educational content to achieve each goal (Table 1). Educational goal No. 1 is that all staff, including

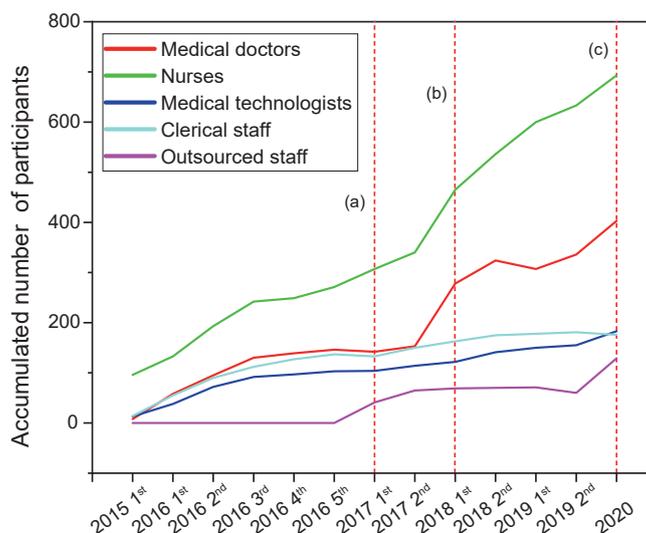
outsourced staff, realize that "Hirosaki University is AREMSC." Educational goals No. 2 and 3 are to teach basic terms and knowledge about radiation protection and biological effects and introduce the emergency room owned by our university. The content related to educational goal No. 2 is specifically designed to help each student understand that radiation is used in various fields, including medical and industrial fields, and presents data on natural and medical exposure doses. Content related to educational goal No. 3 introduces the equipment and supplies of the fully equipped Hirosaki University Hospital Advanced Emergency and Critical Care Center. Materials are developed to promote the understanding that clerical staff should also respond to emergencies.

### 2.2. Notification of the in-house REM training to staff

We use a broadcast email to send monthly notifications regarding internal REM training to those who have not yet attended the training. In addition, we ensure that information about the training is disseminated by sending the notice of training and attendance status (list of non-participants) in writing or as electronic data to each department.

### 2.3. Efforts to train through e-learning

A DVD containing the lectures was prepared for in-house REM training held from April 1, 2020. To achieve the same goals, we created a one-hour video based on the DVD's content. All staff's participation status was recorded in a Microsoft Excel management file. In addition, we recorded the affiliations, names, user IDs, passwords, course due dates, and completion dates of those who wished to take the e-learning course and managed the information on course participants by updating the management file of those who completed the training.



**Fig. 1.** Changes in the number of participants in in-house training on radiation emergency medicine at Hirosaki University from 2015 to 2020. In addition, when the staff who took the course retired, they were excluded from the total. The message to inform outsourced staff of the training since 2017 (point “a” in the figure). Each department has been notified of employees who have not yet attended training since 2018 (point “b” in the figure). After 2020 (point “c” in the figure), e-learning training was launched.

**Table 2.** Changes in the completion number/training rate of in-house staff in radiation emergency medicine by occupation at Hirosaki University

Occupation	Completion number/rate by job category at the end of each session <sup>a</sup>												
	2015 1 <sup>st</sup>	2016 1 <sup>st</sup>	2016 2 <sup>nd</sup>	2016 3 <sup>rd</sup>	2016 4 <sup>th</sup>	2016 5 <sup>th</sup>	2017 1 <sup>st</sup>	2017 2 <sup>nd</sup>	2018 1 <sup>st</sup>	2018 2 <sup>nd</sup>	2019 1 <sup>st</sup>	2019 2 <sup>nd</sup>	2020
Medical doctors	8 (2.6%)	58 (12.6%)	95 (20.6%)	130 (28.2%)	139 (30.2%)	146 (31.7%)	142 (30.3%)	153 (32.7%)	278 (57.2%)	324 (66.7%)	307 (64.5%)	336 (70.6%)	403 (80.0%)
Nurses	96 (17.6%)	133 (21.3%)	193 (30.9%)	242 (38.8%)	249 (39.9%)	271 (43.4%)	307 (45.1%)	340 (49.9%)	465 (68.0%)	536 (78.4%)	600 (83.6%)	633 (88.2%)	693 (98.7%)
Medical technologists	13 (8.3%)	38 (21.2%)	72 (40.2%)	92 (51.4%)	97 (54.2%)	103 (57.5%)	104 (55.9%)	114 (61.3%)	122 (64.9%)	141 (75.0%)	150 (76.5%)	155 (79.1%)	183 (89.7%)
Clerical staff	14 (10.1%)	55 (33.1%)	90 (53.9%)	112 (67.1%)	127 (76.0%)	137 (82.0%)	133 (76.4%)	150 (86.2%)	163 (89.1%)	175 (96.7%)	178 (96.7%)	181 (96.3%)	176 (96.2%)
Outsourced staff	-	-	-	-	-	-	41 (58.6%)	65 (92.9%)	69 (53.9%)	70 (54.7%)	71 (44.4%)	60 (38.7%)	129 (71.3%)
Completion rate for all staff	131 (11.4%)	284 (19.9%)	450 (31.4%)	576 (40.3%)	612 (42.8%)	657 (45.9%)	727 (46.0%)	822 (52.1%)	1097 (65.7%)	1247 (74.7%)	1306 (75.3%)	1365 (78.8%)	1584 (89.3%)

*a)* The completion rate per occupation is calculated per the following formula by comparing the staff list as of April 1:

Completion rate = (Number of employees per job type who have completed the training at the end of each training period) / (Number of employees per job type eligible for training at the beginning of each year)

### 3. Results

The status of the in-house REM training completion number since 2015 is shown in Figure 1. Until 2016, training was provided only for medical doctors, nurses, medical technologists (such as radiological technologists and pharmacists), and clerical staff, but since 2017, training has also been provided for outsourced staff (such as security staff). Specifically, when we sent training notifications to each department beginning in 2018, which is indicated by point “b” in the figure, the number of participants increased dramatically compared to previous events. Furthermore, despite some variation,

there was a continuous increase in the number of attendees (depending on job type). As for outsourced staff, the effect of the intervention was not as evident as in Figure 1 because of staff turnover every year, as well as the retirement of staff who had taken the course. The growth rate of training completion was 4.1% from 2018 to 2019, but increased to 10.5% in 2020, when the transition to e-learning was made, compared to the previous year. The specific numbers and percentages of the staff who participated in the training are shown in Table 2. At the end of 2020, 89.3% of the total staff had already undergone training.

#### 4. Discussion

These results found that sending individual notifications to the staff and intervening with those who have not attended effectively obtained their active participation in the in-house REM training. In addition, in 2020, which took the form of e-learning training, the completion rate increased by 10.5% compared to 2019, which was conducted by gathering trainees in a traditional style. Therefore, it is likely that the advantage of not being tied to time or space effectively promotes training attendance. Due to the influence of COVID-19 in recent years, many training sessions on radiation emergency medicine have been canceled or postponed nationwide, so it can be supposed that the importance of e-learning training will increase in the future.

Based on the results summarized in Table 2, 89.3% of all staff members have completed the course at the end of 2020. It has been found that a high completion rate can be maintained despite personnel changes and clinical work. In addition, there is no variation in attendance depending on the occupation, and there is a balanced number of employees attending by occupation. Access to e-learning is considered the reason for this change since e-learning makes it possible for staff who could not participate previously. Our goal is to maintain the current attendance rate while aiming for a 100% attendance rate. In the future, we should focus on follow-up training to improve knowledge retention. In addition, it is necessary to verify to which extent the attendance of in-house REM training has contributed to the acquisition of knowledge about nuclear disasters. A survey of awareness of cooperation in the event of a radiation emergency must also be done.

Since the Nuclear Emergency Response Guidelines were presented and the current nuclear disaster medical system began, as of July 1, 2021, 50 NECHs have been designated nationwide<sup>6)</sup>. While the number of medical institutions required to carry out in-house REM training is increasing, it is difficult for stakeholders to collect

information because few documents introduce their efforts. We hope that this article will encourage you to present radiation emergency medical education at medical institutions nationwide, including nuclear disaster base hospitals.

#### Acknowledgements

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#### Conflict of Interest

The authors declare that they have no conflict of interest.

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