



# Changes in Knowledge Levels through Lectures on Radiotherapy to Nursing Students in Japan

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## Abstract

**Background:** Recently, the number of patients choosing radiotherapy is increasing in Japan. It is necessary for even nurses to have knowledge of radiotherapy. We measured the degree of awareness with a lecture on how a nursing student can obtain knowledge of radiotherapy.

**Materials and methods:** Forty nursing students who were in their third year and preparing for their national nursing certification in two months were recruited. The 90-min lecture covered a range of topics from general theories to specific concepts. The students were not informed that they would be required to fill a survey at the end of the lecture. This was to avoid bias that could occur from knowing in advance that a survey would be conducted.

**Results:** The following items below were particularly remarkable. The distinction between the radiologist and the radiation oncologist. The radiotherapy is a local therapy. The pain from bone metastasis could be relieved.

**Conclusion:** Students had very little knowledge on radiotherapy before the lecture. The results of this study indicated the need to increase the number of lectures on radiotherapy for nursing as well medical students. As the number of radiotherapy patients increases.

**Keywords:** Radiotherapy; Nurse; Education; Japan

## Introduction

In many nursing schools, lectures on radiation medicine are grouped together under one subject area and include topics on radiology and radiation oncology. Many students are unaware that these lectures are delivered in different departments. In a survey by Inoue et al. that was conducted on students in nursing schools and departments in Japan, the authors found that only one or two classes were dedicated to these subjects and that even though students are aware of some terms, the length of class time was insufficient for students to understand the details of these terms [1].

Within the limited class time for the general area of radiation medicine, students must learn about radiology and radiation oncology. Among medical personnel specialized in radiation medicine, radiologists are physicians specialized in diagnosing diseases, while radiation oncologists are physicians, such as oncological surgeons, who specialize in surgical therapy for cancer.

There have been several reports on radiation medicine and nursing education, but they have focused on radiation research in general; thus far, no reports are available on the specific assessment of radiotherapy alone [1-4]. Radiotherapy is becoming a widely known treatment after chemotherapy and surgery, and there are many occasions when patients themselves ask nurses about radiotherapy.

In this survey, we delivered a 90-min lecture to third-year nursing students who were to take their national nursing certification two months later and conducted an anonymous survey to determine the extent of knowledge the students were able to gain from the lecture.

## Methods and Subjects

Forty nursing students who were in their third year and preparing for their national nursing certification in two months were recruited. Among these, 30 were women and 10 were men, and their mean age

was 29 years. The oldest candidate was 46 years (24 students in their 20s, 11 in their 30, and 5 were between 40 and 46 years). General statements could not be made about the quality of the students, but they were students in a school where most students generally pass the national certification examination every year.

As shown in Table 1, the 90-min lecture covered a range of topics from general theories to specific concepts. The students were randomly chosen to respond to questions, and even though they were allowed to discuss the questions to get help from fellow students, they provided their final responses individually. Teachers went through the attendance sheet to ensure that each student had the chance to answer at least one question in each class.

The students were not informed that they would be required to fill a survey at the end of the lecture. This was to avoid bias that could occur from knowing in advance that a survey would be conducted. Table 1 shows how the changes in the level of newly acquired knowledge from attending the class, which were graded on a 5-point scale. The questionnaires used for the survey were anonymous, and the students were informed in writing that the choice to not participate in the survey would not impact their grades. Completed surveys were collected only from students who consented.

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Please rate the changes in your level of understanding after the lecture compared to that before the lecture on a scale of 1 to 5.	Before lecture	After lecture	P-value
	Mean ± SD	Mean ± SD	
1. I knew that there are radiologists and radiation oncologists among specialists in radiation medicine.	1.7 ± 1.2	4.0 ± 0.9	<0.01
2. I knew that radiologists made a diagnosis based on images.	3.1 ± 1.3	4.4 ± 0.8	<0.01
3. I knew that radiation oncologists treated their patients with radiation (X-ray).	3.0 ± 1.5	4.5 ± 0.6	<0.01
4. I knew that radiotherapy is a local therapy.	3.0 ± 1.4	4.4 ± 0.6	<0.01
5. I knew that there are no effects on body parts that are not irradiated.	2.6 ± 1.3	4.2 ± 1.0	<0.01
6. I knew that radiotherapy is applied in the form of fractionated irradiation in general (20–40 times).	2.0 ± 1.2	4.1 ± 0.9	<0.01
7. I knew that the radiation does not stay in the body after irradiation.	2.8 ± 1.4	4.1 ± 0.9	<0.01
8. I knew that the units of radiation are gray (Gy).	4.4 ± 0.9	4.6 ± 0.6	<0.01
9. I knew that normally each radiation dose is 2 Gy.	1.5 ± 1.2	3.7 ± 1.2	<0.01
10. I knew about stereotactic radiotherapy.	2.7 ± 1.2	4.0 ± 0.9	<0.01
11. I knew that pain from bone metastasis can be relieved.	2.2 ± 1.2	4.1 ± 0.9	<0.01
<b>I knew that radiotherapy is indicated for the following cancers:</b>			
Brain metastasis	2.2 ± 1.2	4.0 ± 0.8	<0.01
Bone metastasis	2.2 ± 1.1	4.0 ± 0.8	<0.01
Head and neck cancer	2.1 ± 1.3	3.9 ± 1.1	<0.01
Breast cancer	2.8 ± 1.1	4.2 ± 0.8	<0.01
Lung cancer	2.4 ± 1.2	4.1 ± 0.9	<0.01
Gynecological cancer	2.1 ± 1.1	4.1 ± 0.8	<0.01
Prostate cancer	2.2 ± 1.1	3.9 ± 0.8	<0.01

**Table 1:** Changes in the level of newly acquired knowledge from attending the class, which were graded on a 5-point scale.

## Results

A statistically significant increase in knowledge was observed in all scored items. This was particularly remarkable for understanding 1) the distinction between the radiologist and the radiation oncologist, 5) that radiotherapy is a local therapy, 6) that fractionated irradiation is given for maximizing the therapeutic benefits of radiation, and 11) that pain from bone metastasis could be relieved.

## Discussion

### On the radiology department

Presently, the education and training given to nurses in radiation medicine is far from sufficient [1,2]. The field of radiotherapy and its applications in cancer therapy have developed very rapidly in recent years. There has been wide coverage in the media about the benefits of specific types of radiation therapy. For example, the fields of intensity modulated radiotherapy, which depends on the shape of the tumor, and the so-called stereotactic radiotherapy have received considerable attention in the media; thus, they are widely known among common patients. This new awareness has led to many instances where patients themselves request to undergo radiotherapy.

Medical devices used in diagnostic radiology have also dramatically improved with the advent of imaging technologies such as fluorodeoxyglucose-positron emission tomography or multi-detector computed tomography (CT) for imaging large regions of the body to detect tumors. However, even though students may know how these devices emit radiation, they have very few opportunities for receiving detailed knowledge, such as how much radiation is actually released and what are the effects of radiation on the human body. These topics are covered in the lectures.

Many professionals and institutions, from independent doctors

to general hospitals, use procedures such as CT widely in diagnostic radiology. However, generally, radiotherapy can only be applied in general hospitals. In either case, we can expect an increased demand of being able to respond to patient inquiries regarding radiology testing and irradiation.

The present survey results showed that many nursing students believed that the radiology department functioned to provide radiology and radiation oncology services (before the lecture: 1.7 on a 5-point scale). However, this misconception is not limited to nursing students. We believe that there are many medical students who similarly do not make the distinction between these two services. Thus, we believe that a similar type of education is necessary for medical students as well.

The results of this survey suggested that it is important for nursing students to understand from early on that radiology and radiation oncology are separate specializations. Similar questionnaires should be given to medical students as well to determine their level of knowledge in radiation medicine.

### On radiotherapy

Since the introduction of the new certification system in 2010, there are 224 Radiation Oncology Certified Nursing Specialists as of 2016. Requirements for this certification are as follows: students must have a minimum of 5 years of internship experience after obtaining their nurse's certification (of which 3 years or more, must be as internship experience in the area of nursing that they are certified), students must have completed a program at an educational institution for becoming a Certified Nurse (a course for 6 months or 615 h or more), and students must have passed the written examination (certification assessment).

For certified nurses who frequently interact with cancer patients, training covers not only patient care during and after radiotherapy

but also nursing education in radiotherapy. Although the number of certified nurses is gradually increasing, Noto et al. reported that Radiation Oncology Certified Nurse Specialists spend relatively little time to practice their area of expertise compared to certified nurses in other areas because of difficulties in securing time for practice in the field of radiation oncology [3].

Nursing education in radiotherapy in Japan is different from that in other countries [5-8]. The main differences are that “Oncology Nursing” is an independent area and that its sub-field “Radiotherapy Nursing” is taught in parallel to fields such as chemotherapy nursing or perioperative nursing. Komprood et al. reported that training nursing students to obtain detailed knowledge on cancer patients as part of nursing education promotes proactive care for cancer patients later on when these trained nurses enter their profession [7].

Treatment and care differ depending on the localization and type of cancer. Therefore, it is difficult to acquire specialized knowledge on radiotherapy for each type of cancer while still a student. Thus, it is ideal to provide education on radiotherapy as one of the topics in oncology nursing. Furthermore, it is essential to increase the number of hours spent on providing education about radiotherapy applied to patients as the number of patients receiving this therapy is expected to increase in the future.

## Conclusion

We surveyed knowledge on radiotherapy in nursing students in

Japan. Students had very little knowledge on radiotherapy before the lecture, and many students did not know that radiology and radiation oncology are separate fields. As the number of radiotherapy patients increases, we can also expect an increase in the number of occasions where nurses will be asked questions about radiotherapy. Thus, the results of this study indicated the need to increase the number of lectures on radiotherapy for nursing as well medical students.

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