

Authors

Acelya Turkmen

PhD
Cukurova University, Faculty of Health Sciences, Department of Nursing Sarıcam/Adana

Professor Ayfer Ozbas

PhD
Istanbul University-Cerrahpasa, Florence Nightingale Faculty of Nursing

Gönül Yılmaz Dunder

PhD
Bandırma Onyedi Eylül University, Faculty of Health Sciences, Department of Nursing Bandırma/Balıkesir

Corresponding author

Acelya Turkmen

PhD
Cukurova University, Faculty of Health Sciences, Department of Nursing Sarıcam/Adana
acelyaturkmen2@gmail.com

Determining the attitude of operating room nurses to radiation exposure: A descriptive study

Abstract

Objective

This study aims to determine the attitude of operating room nurses to radiation exposure.

Methods

This descriptive study was conducted with 70 nurses working in the operating room of two university hospitals belonging to a university in Istanbul. Descriptive statistical analyses were performed using IBM SPSS 23. The protocol of the study was registered in clinicaltrials.gov (NCT04703933).

Results

There was a significant relationship between radiation protection training and the use of protective equipment ($p < 0.05$).

Conclusions

It was found that the nurses working in the operating room had insufficient radiation protection training and there was a positive relationship between radiation protection training and protection behaviour. Seminars should be organised to increase the level of knowledge of nurses about radiation protection practices.

Keywords: radiation protection, radiation, operating room nursing, attitude

Introduction

Operating rooms are dynamic places where advanced technology is used. Operating room personnel face many biological, physical and infectious risk factors. One of these risk factors is ionizing radiation¹. Medical imaging techniques used as diagnostic devices, such as X-ray imaging, computed tomography (CT) and fluoroscopy, lead to patients and medical staff being exposed to radiation^{2,3}.

Radiation is used in many applications in operating rooms and long-term exposure to radiation

may occur. Radiation exposure occurs when all or part of the body absorbs penetrating ionizing radiation from an external radiation source. Radiation exposure also occurs after internal contamination, i.e. when a radionuclide is ingested, inhaled or absorbed into the blood stream⁴.

Radiation can cause serious adverse effects on hematopoietic, immune, reproductive, circulatory, respiratory, musculoskeletal, endocrine, nervous, digestive, and urinary systems^{5,6}. The negative effects of radiation exposure generally fall into two categories: deterministic effects or probabilistic

effects⁷. Although the deterministic effects are directly related to cell death, they occur as a result of exposure of cells to radiation. Deterministic effects may result in infertility, cataract, leukaemia, skin burns and death. Probabilistic effects are associated with the accumulation of absorbed radiation in tissues and may occur even at the lowest dose. Probabilistic effects include genetic disorders and cancer formation^{3,5,6}.

The use of protective equipment plays a significant role in reducing radiation exposure. The use of masks ensures protection from respiratory hazards, the use of protective clothing ensures that the radioactive substance does not damage the skin and hair, and the use of personal dosimeters ensures the management of the duration of stay in an area with high radiation levels and the monitoring of accumulated doses⁸.

The chance of radiation exposure is very high for operating room nurses⁹; therefore, nurses should have sufficient information about radiation and protection from radiation¹⁰. This study was carried out to determine the attitude of operating room nurses to radiation exposure.

Materials and methods

Study design

A descriptive study. The protocol of the study was registered in clinicaltrials.gov (NCT04703933).

Population and sample

This research was conducted in two university hospitals belonging to a university in Istanbul. The sample of the study consisted of 70 volunteer operating room nurses.

Instruments

The data were collected with a data collection form created by the researchers and based on

Table 1: Nurses' demographic characteristics (N=70)

Variables		n	%
Age	18–25	21	30.0%
	26–35	31	44.3%
	36–45	17	24.3%
	46 years or more	1	1.4%
Gender	Female	60	85.7%
	Male	10	14.3%
Marital status	Married	32	45.7%
	Single	38	54.3%
Educational status	Vocational high school of health	9	12.9%
	Associate degree	6	8.6%
	Bachelor's degree	40	57.1%
	Postgraduate degree	15	21.4%
Professional experience	1–5 years	33	47.1%
	6–10 years	17	24.3%
	11–15 years	8	11.4%
	16–20 years	7	10.0%
	21 years or more	5	7.1%
Operating room experience	1–5 years	43	61.4%
	6–10 years	17	24.3%
	1–15 years	5	7.1%
	16–20 years	3	4.3%
	21 years or more	2	2.9%
Role	Scrub nurse	22	31.4%
	Circulating nurse	11	15.7%
	Scrub and circulating nurse	37	52.9%
Hours worked each week	Less than 40 hours	2	2.9%
	40–49 hours	38	54.3%
	50–59 hours	26	37.1%
	60 hours or more	4	5.7%

the relevant literature¹¹. The data collection form consisted of a total of 18 questions regarding radiation exposure, such as the number of professional working years, the number of years working in the operating room, the nursing role, the tasks involved, the exposure

to radiation technology, the use of protective measures when exposed to radiation technology, the use of personal dosimeter and radiation level measurements in the operating room. Demographic data, such as age, gender, and educational status, were also collected. Pilot implementation

Table 2: Nurses' exposure to radiation and radiation protection used (N=70)

Variables		n	%
Exposure to radiation technology in the last year	Yes	52	74.3%
	No	18	25.7%
Frequency of exposure to radiation technology	More than once a day	12	17.1%
	More than once a week	30	42.9%
	Once a week	5	7.1%
	Once a month	6	8.6%
	None	17	24.3%
Protective equipment use with radiation technology	Yes	57	81.4%
	No	13	18.6%
Items of protective equipment used with radiation technology	Protective eyewear and gloves	20	28.6%
	Thyroid shield	44	62.9%
	Lead apron	54	77.1%
Radiation protection training received	Yes	35	50.0%
	No	35	50.0%
Presence of radiation hazard warning signs in the work area	Yes	46	65.7%
	No	24	34.3%
Dosimeter use	Yes	25	35.7%
	No	45	64.3%
Operating room radiation levels measured	Yes	30	42.9%
	No	40	57.1%
Care taken when using radiation technology	Yes	48	68.6%
	No	22	31.4%

was carried out with ten operating room nurses before starting the research.

Ethical review statement

Necessary permissions were obtained from the Istanbul University Cerrahpasa Ethics Committee (255651) before starting the research.

Data analysis

The research data were evaluated using IBM SPSS 23 (Statistical Package for Social Sciences for Windows, Version 23.00, Armork NY) program. In

the analysis of the data, frequency and percentage among descriptive statistical methods were used. Kolmogorov-Smirnov Goodness of Fit Test was used for normality analysis of the data obtained. The chi-square test was used to evaluate normally distributed data. Significance level was accepted as $p < 0.05$.

Results

Since the study was conducted in two hospitals belonging to the same university, the radiation protections measures applied and the results

obtained at the two hospitals were not different from each other.

Demographic characteristics of the nurses are shown in Table 1 – 44.3 per cent were between the ages of 26 and 35, 85.7 per cent were female, and 57.1 per cent had a bachelor's degree. Approximately half the nurses had one to five years of professional experience and 61.4 per cent had one to five years of operating room experience.

Nurses' exposure to radiation is shown in Table 2 – 74.3 per cent of the nurses were exposed to radiation in the last year, 42.9 per cent were exposed to radiation technology more than once a week, 81.4 per cent of the nurses used protective equipment when using radiation technology, 28.6 per cent used protective eyewear and gloves, 62.9 per cent used thyroid shields, and 77.1 per cent used lead aprons. It was found that half of the nurses participating in the study received radiation protection training, 65.7 per cent stated that there were radiation danger signs in the operating rooms where they worked, and 57.1 per cent stated that radiation level measurements were not performed where they worked. It was determined that 64.3 per cent of the nurses did not use a dosimeter and 31.4 per cent of the operating room personnel did not take the necessary care when using radiation technology.

Table 3 shows the relationship between radiation protection training and radiation protection attitudes in the nurses. It was determined that 94.3 per cent of the nurses who received radiation protection training used protective equipment ($p < 0.05$). The rates of use of protective eyewear and gloves, thyroid shields, lead aprons, and dosimeters as protective equipment were 51.4 per cent, 80 per cent, 91.4 per cent and 65.7 per cent, respectively ($p < 0.05$).

Table 3: The relationship between nurses receiving radiation protection training and radiation protection used (N=70)

Characteristics Yes (%)		Radiation protection training		
		Yes (%)	No (%)	p
Protective equipment use	Yes	94.3	68.6	0.006
	No	5.7	31.4	
Protective eyewear and glove use	Yes	51.4	5.7	0.000
	No	48.5	94.3	
Thyroid shield use	Yes	80	45.7	0.003
	No	20	54.3	
Lead apron use	Yes	91.4	62.9	0.005
	No	8.6	37.1	
Dosimeter use	Yes	65.7	5.7	0.000
	No	34.3	94.3	
Care taken when using radiation technology	Yes	91.4	45.7	0.000
	No	8.6	54.3	

It was found that those who received radiation protection training took the necessary care when using radiation technology, had radiation danger signs in the operating rooms where they worked, and radiation level measurements were performed ($p < 0.05$).

Discussion

Approximately seven million health workers worldwide are exposed to occupational radiation¹³. The Turkish Atomic Energy Authority (TAEK) regulates the safe use of sources of ionizing radiation and radiation protection in Turkey. The TAEK regulations follow the ALARA (as low as reasonably achievable) principle of radiation safety which recommends three protective measures – time, distance and armouring¹². That is, reducing time of exposure, maximising distance between the radiation source and personnel, and putting a shield between the radiation source and personnel. Radiation technology is used in many applications in Turkish

operating rooms, and operating room personnel are exposed to the negative effects of radiation. Therefore, attitude towards ionizing radiation plays an important role in protection from radiation and safe application of radiation technology. This study aimed to determine the attitude of operating room nurses to radiation exposure.

Previous studies have reported a positive relationship between attitudes to radiation protection and knowledge level^{9,14,15,16,17}. It is observed in the literature that the majority of nurses know the harmful effects of radiation but do not pay attention to protection measures^{3,18,19}. The literature also states that nurses have insufficient information about radiation and protection from radiation, and the vast majority of them are exposed to radiation^{1,20,21}. The current study determined that half of the nurses received radiation protection training and the majority of the nurses who received protection training paid attention to the use of radiation technology.

Radiation protection training given to nurses included the use of radiation technology, protective equipment and radiation signs.

The use of personal dosimeters ensures the management of the duration of stay in an area with high radiation levels and the monitoring of accumulated doses⁸. Studies by Alavi et al²² and Güden et al²³ found that the majority of the participants used personal dosimeters^{22,23}. In contrast, this study found that the majority of nurses did not use personal dosimeters.

The use of protective equipment is essential for radiation protection. Güden et al²³ reported that the majority of personnel did not use protective lead aprons²³. Yasak and Vural²⁴ stated that the majority of personnel did not use protective equipment, although lead aprons were available in the operating rooms²⁴. In contrast, the current study found that the majority of operating room nurses used protective equipment and the protective equipment that was used most often were lead aprons followed by thyroid shields.

Conclusion and recommendations

It is seen that the majority of operating room nurses are exposed to radiation, the training received for radiation protection is insufficient, the majority of operating room nurses take care to use protective equipment but do not use personal dosimeters. For this reason, it is recommended that training programs and seminars be provided for nurses to protect themselves from radiation.

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