Effect of Radiotherapy Safety Protocol on Protective Measures Practices for Oncology Nurses

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ABSTRACT

Background: Increased exposure to ionizing radiation exposes nurses and patients to health risks. Adhering to safety precautions can help lower the risk of health-related incidents. **Aim:** The aim of this study was to evaluate the effect of radiotherapy safety protocol on protective measures practices for oncology nurses. **Study design:** The current study employed a quasi-experimental research approach, specifically a one-group pretest-posttest design**. Setting :**This study was conducted at Oncology and Nuclear Medicine at Mansoura Hospital and Damietta Cancer Institute. **Subjects:** A convenient sample of available nurses working in previously mentioned settings (60) nurses. **Tool:** Two tools used for data collection: the Workplace Observation Checklist and the Nurses' Observational Checklist. **Results:** Most areas for improvement were wearing protective measures such as Thyroid shield, personnel monitoring devices ranged from (20,0%), (10,0%) respectively to (90,0%) and reporting of hazards that may occur from radiation such as cancer and blood changes ranged from (48.3%), (60,0%) respectively to (100%) post protocol implementation. **Conclusion:** Nurses' levels of protective measures practices for radiotherapy had improved after the implementation of the safety protocol. **Recommendations:** Training sessions are required to improve staff safety practices and ensure good performance.

Keywords: Radiotherapy Safety Protocol, Oncology Nurses, Protective Practices

INTRODUCTION

The utilization of ionizing radiation in the medical domain has been experiencing a significant surge in growth ever since the discovery of X-rays. Individuals working in the radiology department of most hospitals are regularly exposed to one or more types of radiation, which are used for therapeutic and diagnostic purposes. This radiation can be categorized as either ionizing or non-ionizing radiation. Ionizing radiation encompasses computer tomography, nuclear medicine, fluoroscopy, and x-ray. The non-ionizing methods include magnetic resonance imaging (MRI) and ultrasound (Shati Qutbi, Jwad Taher, and Ahmed Mahdi 2021).

Unnecessary imaging could be minimized through the medical staff's awareness and the implementation of protective measures such as personal protective equipment, monitoring devices, and dose control aspects to standard practice, Although exposure during the occupation of ionizing radiation has remained within the currently accepted limits set by the International Commission on Radiological Protection (ICRP), there are an increased risk health hazards as leukemia and multiple myeloma or solid cancers (Maharjan et al. 2020).

The system of protection protocol is based on the principles of justification, optimization, and dose limitation. According to the justification principle, there should be more benefits than hazards when it comes to changing exposure settings. The optimization concept aims to minimize exposure in any given situation by considering economic and societal factors. Radiologists are subject to occupational dosage limits, but patients undergoing medical procedures do not have any dose restrictions.(Vañó et al. 2017).

In Egypt, the legislative Egyptian Law No. 59/1960 specifies the measures for radiation safety. The Ministry of Health and the Egyptian Atomic Energy Authority are the official regulatory authorities responsible for accrediting and overseeing the usage of radiation sources. The Ministry of Health is responsible for managing closed sources and X-ray technologies. Prior research in Egypt has revealed insufficient implementation of safety protocols and procedures in the majority of ionizing radiation facilities. (El-Feky et al. 2017).

For everyone who works in the radiation department, there are requirements for occupational radiation safety precautions as nurses and anybody who might be exposed to radiation surroundings even sporadically. Prior research demonstrates the absence of radiation safety awareness among nurses who have been exposed to radiation. Additionally, they also need to get training and education suitable for their positions and shielded by instruments and apparatus, particularly in light of the expanding widespread application of radiation in several medical protocols (Ahmed, Fahmy, and Sharkawy 2021).

Significance of the Study

Despite the fact that the availability or lack of protective equipment was the primary factor influencing radiation protection practices(Park and Yang 2021) The factors that have the greatest influence on radiation protection behaviors knowing radiation protection, including wearing protective equipment and updated radiation protection instruction (Lee et al. 2020) Therefore, the goal of this study is to investigate how protective measures among oncology nurses have changed as a result of the designed safety protocol.

AIM OF THE STUDY

This study aimed to evaluate the effect of radiotherapy safety protocol on protective measures practices for oncology nurses.

Study Objectives

1. Assess oncology nurses' levels for protective measures practices of radiotherapy.
2. Design radiotherapy safety protocol on protective measures practices for oncology nurses.
3. Implement radiotherapy safety protocol.
4. Evaluate the effect of radiotherapy safety protocol on protective measures practices for oncology nurses.

Operational definition

Protective measures: are items that help nurses to protect themselves from occupational hazards during radiotherapy.

Research hypothesis

Nurses' levels of protective measures practices for radiotherapy will be improved after the implementation of the safety protocol.

SUBJECTS AND METHOD

I. Technical Design

Study Design

The current study employed a quasi-experimental research approach, specifically a one-group pretest-posttest design.

Study setting

The study was conducted at Oncology, Nuclear Medicine at Mansoura Hospital, consisting of three floors of five rooms with four beds in each room, and Damietta Cancer Institute, which consists of one floor of six rooms with four beds in each room.

Study sampling and subjects

A convenient sample of available nurses working at previously mentioned settings (60) nurses,48 nurses at Oncology, Nuclear Medicine, Mansoura Hospital, and 12 nurses at Damietta Cancer Institute.

Tools of data collection

Two tools were used to collect data for this study.

Tool (I) Workplace Observation Checklist

The workplace observational checklist was developed based on the standard set by the International Atomic Energy Agency (IAEA). The Nuclear Safety Standard Committee validated it based on the International Commission on Radiological Protection standard. This tool is composed of 15 questions such as workplace design, presence of personal protective clothing and equipment, registers and records, receipt and

transfer of radiation sources, radio-pharmaceutical therapy, radioactive waste management, transport of radioactive sources, etc.

Scoring system

The total scores of the observation part were 0 to 15 marks graded as the following: One mark for each correct answer and zero for each incorrect answer. The total observation was considered satisfactory if it was 60% and more and unsatisfactory if it was less than 60%.

Tool (II): Nurses' Observational Checklist:

The researcher produced it by conducting a comprehensive evaluation of pertinent and up-to-date literature. (Ahmed, Diab, and Sharkawy 2022; Marshall et al. 2023)it included two parts:

Part I: Personal and work-related data of nurses:

It included 20 questions about the nurses' attributes and work-related data, including age, marital status, unit assignment, educational attainment, years of professional experience, length of service in the radiation unit, participation in a training program focused on irradiation safety protocol, etc.

Part II: observational checklist for protective equipment.

It contained 3 steps about how to control radiation exposure, and it covered the identification of health risks, adherence to the "As Low as Reasonably Achievable" (ALARA) principle for controlling radiation exposure, utilization of personal protective equipment such as lead aprons, lead gloves, thyroid shields, eye goggles, personal monitoring devices, and considerations for managing radiation dosage.

Scoring system

The observations were classified as binary, with responses limited to either "Done" or "Not Done ". The coding for the checklist was conducted by assigning a score of one point for the done item and a score of zero points for not done points. According to the IAEA standard; Units that attained a score equal to or exceeding two-thirds of the

overall score (≥66,7%) were considered to have sufficient radiation safety measures, those that achieved from one-third to less than two-thirds (33,4 to 66,7%) were considered to have somewhat sufficient measures and those that achieved less than one - third (< 33,4%) were considered to have insufficient radiation safety measures.

Ethical consideration

Approval has been taken from the Research Ethics Committee of the faculty of nursing at Port Said University. Moreover, approval was taken from hospital directors and each participant nurse to participate in the study after an explanation of the study aims. The nurses have received a guarantee about the confidentiality of the information collected, which will only be utilized for the study's intended purpose. The researcher notified the study nurses that they owned the prerogative and that they could voluntarily discontinue their participation in the study at any given moment without encountering any difficulties.

II. Operational Design

The operational design comprised several stages, namely the preparation phase, tool validity, reliability assessment, fieldwork, and pilot study.

A-Preparation Phase

The process involved conducting a comprehensive examination of existing literature, diverse studies, and theoretical understanding related to different parts of the research subject, utilizing books and articles, Internet official websites e.g. PubMed, Ovid, Cochrane Library, periodicals to get acquainted with the research problem and develop the study tools.

B- Tool Validity

All study tools were ascertained by a jury consisting of nine experts in medical and nursing faculty staff at Port Said University to assess the accuracy and applicability of the tools and modifications were made according to their opinions.

C-Content Reliability

The Cronbach's alpha test result for the first tool indicated a reliability of 0.984. Cronbach's alpha test resulted in a reliability score of 0.967 for the second tool.

D -Fieldwork

The data was collected throughout 9 months, the actual fieldwork was carried out from the beginning of March 20, 2021, to the end of November 20, 2021. The study was carried out through the following phases:

- **Assessment phase**

The data was collected from available nurses who have been working at previously mentioned settings and who have been providing direct care to patients using tools I, and II. The tool I was developed to check the safety measures in the units of the studied departments. Tool II was created to evaluate nurses' practices regarding radiotherapy safety measures.

- **The educational protocol development phase**

Based on the assessment of nurses about radiation safety measures. The protocol is designed after reviewing the International Commission on Radiological Protection (Durduran et al. 2018)to improve the knowledge and practices of nurses about radiotherapy safety measures by the studied tools included in this period were the following:

a) Setting objectives

The educational protocol aimed to improve nurses' practice regarding radiotherapy protective measures.

b) Preparation of the content

Content covered all areas of nurses' practices regarding radiotherapy safety measures which included the following: A) Theoretical parts include definition, uses, types of radiation, sources of radiation at the hospital, criteria of radiation unit, medical uses of radiation, health hazards of radiation, safety measures at the unit of radiation and

prevention of radiation hazards. B) The practical part includes using the correct method for protective measures for hand washing, wearing gloves, and mask, applying a gown and apron, etc.

c) Planning of action

In this step, the researcher designed a plan for educational radiotherapy safety protocol implementation.

- The 12-week educational program included three sessions divided out during the time. Early meeting schedules and 30–45-minute meeting lengths were standard. There were ten groups in all (6 subjects each). The ideal timing for each group to receive the educational protocol was completely up to them.
- The designed protocol focused on items to be learned, using selected adult teaching methods such as projected role-playing, and discussion and the instruction booklet was given for each nurse for attracting her attention.

- **Educational program implementation phase**

Each group was then brought together individually in a conference room. The implementation of educational sessions was conducted as; each group obtained three sessions a week, each session took about one hour (the researcher took more than one group each day and more than one session each week).

- The first session consists of the definition of radiotherapy. Types of radiotherapy,
- Radiotherapy Dynamic, methods of giving radiation therapy.
- The second session consists of ways of exposure to radiation therapy, the risks of radiation therapy on nurses, and the side effects of radiotherapy on the patient.
- The third session consists of the necessary steps during dealing with radiation therapy, the necessary steps after the patients end the radiotherapy session, and preventive measures during radiation therapy.

Evaluation Phase

It was carried out two times, the first time immediately on the first visit. The second time after one month of applying the safety protocol to evaluate nurses' practice.

A comparison between nurses' pre-tests and post-tests was done to determine the effect of radiotherapy educational sessions on nurses' practice while dealing with radiotherapy.

E- Pilot Study

A pilot study was done on a subset of the sample, including 10% (6 nurses), in the specified institutions to assess the clarity, comprehensibility, and practicability of the data collection methods. The data acquired from the pilot study informed the researcher's modifications to the tools, including the correction or addition of necessary items and the deletion of others. Consequently, alterations were made, resulting in the creation of the final version. The nurses who were part of the pilot study were not included in the sample that was studied.

III -Administrative Design

The Dean of the Faculty of Nursing at Port Said University addressed an official letter to the directors of each setting, to obtain their approval for data collecting in the Oncology and Nuclear Medicine units at Mansoura and Damietta hospitals. The letter included the title and objective of the project.

IV. Statistical Analysis

The obtained data has been organized, categorized, tabulated, and analyzed by using a statistical package for the social sciences SPSS (version 20.0**,** IBM Corp., 2011). Numerical and percentage values were used to describe qualitative data. The quantitative data was characterized using the range (minimum and maximum), mean, standard deviation, and median. The Wilcoxon signed ranks test was employed to compare between two periods for irregularly distributed quantitative variables. The level of significance was set at a P value of less than 0.05.

RESULTS

Table (1) illustrates the socio-demographic characteristics of studied nurses, elaborating that 38,1% of the studied nurses were aged less than thirty years while 33,3 aged > forty years, concerning their sex 60.0% were male,81.7% were married, all lived with their family and 51.7% had Bachelor of Nursing and according to the number of years working as a nurse 48.3% of them working to less than 5 years with the mean of

5.40 ± 0.81 years working with radiotherapy and mean of 6.33 ± 1.51 hours working per day with 80.0% of them dealing directly with radiotherapy in the external department.

Table (2) clarifies that there were statistically significant differences between nurses' reports about radiation hazards pre and post-protocol regarding Cancer, blood changes (anemia, leukemia), recurrent abortion, skin burns, premature aging, birth defects, and teratogenic /embryotoxic effects as p-value was (<0.001, <0.001, <0.001, <0.001, <0.001, 0.009) respectively, except for hair loss, cataract and sterility (p=0.281, 0.361, 0.458). The table also indicates that there was a statistically significant difference (P<0.001) between pre- & post-protocol regarding dose control in items related to shielding enough to limit exposure & protection, distances enough to limit exposure & protection, time of exposure enough to limit exposure and protection as p-value was (0.031, 0.000, 0.003) respectively.

Table (3) distributes the nurses according to workplace design pre and post-protocol. It was observed that There was a statistically significant difference observed between nurses' pre-protocol and post-protocol conditions. regarding the place of radiation working areas, Caution Signs & labels, and Warning Devices & Alarms (p<0.001), Also, there was a statistically significant difference between nurses pre and post-protocol regarding the posting of Copies of Ionizing Radiation Standards (p<0.001) except for locations easily seen by workers(p=,458).

Table (4) displays nurses according to wearing protective measures. A statistically significant difference was seen between nurses' pre-protocol and post-protocol data regarding wearing personal protective measures (lead apron, lead gloves, thyroid shields), Personal monitoring devices, and dose control aspects as the p-value was (<0.005) except for wearing eye goggles correctly, wearing personal monitoring devices correctly (p=1.000) and using the correct distance regularly(p=0.458).

Table (5) indicates that there was a marked improvement in the studied Nurses' total score of workplace observation and nurses 'protective measures post-implementation of the safety protocol with a highly statistically significant difference between pre-and post-protocol implementation (P=0.001*).

Table (1): Demographic and work-related data of the studied nurses (n = 60)

Items	No.	%
Age		
<30	23	38.1
30-40	17	28.6
> 40	20	33.3
Sex		
Male	36	60.0
Female	24	40.0
Marital Status		
Married	49	81.7
Not married	11	18.3
The living situation		
Living with family	60	100.0
Educational level		
Technical Secondary school of Nursing (diploma)	0	0.0
Bachelor of Nursing	31	51.7
Technical institute of nursing	29	48.3
Working years as a nurse		
Less than 5 years	29	48.3
From 5-10 years	19	31.7
Over 10 years	12	20.0
Working years dealing with radiotherapy		
Min. – Max.	4.0 – 7.0	
Mean ± SD.	5.40 ± 0.81	
Median	5.0	
The number of working hours per day (hour)		
Min. – Max.	4.0 – 8.0	
Mean ± SD.	6.33 ± 1.51	
Median	6.0	
Deal with radiotherapy		
Directly	48	80.0
Indirectly	12	20.0
Workplace		
External oncology clinic	12	20.0
External department	48	80.0

Table (2): Health hazards and dose control reported by nurses pre and post-protocol implementation (n = 60)

Health hazard	Pre				Post				p
	No		Yes		No		Yes		
	No.	%	No.	%	No.	%	No.	%	
Health hazard									
report the health hazards that may occur from radiation exposure	12	20.0	48	80.0	0	0.0	**60**	**100.0**	<0.001*
If yes, mention the hazard that may occur									
Cancer	19	31.7	29	48.3	0	0.0	60	100.0	<0.001*
Blood changes (anemia, leukemia)	12	20.0	36	60.0	0	0.0	60	100.0	<0.001*
Recurrent abortion	31	51.7	17	28.3	7	11.7	53	88.3	<0.001*
Skin burns	36	60.0	12	20.0	6	10.0	54	90.0	<0.001*
Hair loss	25	41.7	23	38.3	18	30.0	42	70.0	0.281
Cataracts	36	60.0	12	20.0	42	70.0	18	30.0	0.361
Sterility	23	38.3	25	41.7	30	50.0	30	50.0	0.458
Premature aging	42	70.0	6	10.0	11	18.3	49	81.7	<0.001*
Birth defects and teratogenic /embryotoxic effects	30	50.0	18	30.0	18	30	42	70.0	0.009*
Dose control									
Shielding enough to limit exposure & protection	6	10.0	54	90.0	0	0.0	60	100.0	0.031*
Distances enough to limit exposure & protection	12	20.0	48	80.0	0	0.0	60	100.0	0.000*
Time of exposure enough to limit exposure & protection	23	38.3	37	61.7	6	10.0	54	90.0	0.003*

Table (3): Workplace design of the studied nurses' pre and post-protocol implementation(n=60)

I-Work place design	Pre				Post				McN	P
	No		Yes		No		Yes			
	No.	%	No.	%	No.	%	No.	%		
Place of radiation working areas										
Proper design of radiation working areas for radiation work	42	70.0	18	30.0	0	0.0	60	100.0	40.024*	<0.001*
Isolation of radiation working areas from other hospital departments	54	90.0	6	10.0	24	40.0	36	60.0	20.024*	<0.001*
Caution Signs & labels										
A posted sign bearing the radiation caution symbol and the word 'CAUTION RADIATION AREA' in the radiation area	54	90.0	6	10.0	6	10.0	54	90.0	46.021*	<0.001*
Appropriate posted of entry to X-ray rooms	42	70.0	18	30.0	0	0.0	60	100.0	40.024*	<0.001*
Ionizing Radiation Standard										
Posting of Copy of Ionizing Radiation Standard	29	48.3	31	51.7	6	10.0	54	90.0	13.829*	<0.001*
Easily seen by workers	17	28.3	43	71.7	12	20.0	48	80.0	0.552	0.458
Warning Devices & Alarms										
The presence of automatically energized audible warning devices and alarms to help the workers vacate the area before radiation is produced	43	71.7	**17**	**28.3**	0	0.0	**60**	**100.0**	41.023*	<0.001*
If yes										
works properly	6	35.3	11	64.7	0	0.0	60	100.0	–	0.031*
Tested regularly to make sure they respond automatically to an initiating event without requiring any human action	11	64.7	6	35.3	0	0.0	60	100.0	-	<0.001*

Table (4): Wearing protective measures pre and post-protocol implementation (n = 60)

Protective measures	Pre				Post				p
	No		Yes		No		Yes		
	No.	%	No.	%	No.	%	No.	%	
A. Personal protective equipment									
Lead apron									
Wearing lead apron during working hours	6	10.0	54	90.0	0	0.0	60	100.0	0.031*
wearing correctly	6	10.0	54	90.0	0	0.0	60	100.0	0.031*
Frequently if present	60	100.0	0	0.0	54	90.0	6	10.0	0.031*
Lead gloves									
Wearing lead gloves during working hours	6	10.0	54	90.0	0	0.0	60	100.0	0.031*
wearing correctly	6	10.0	54	90.0	0	0.0	60	100.0	0.031*
Frequently if present	60	100.0	0	0.0	42	70.0	18	30.0	<0.001*
Thyroid shield									
Wearing thyroid shield during working hours	48	80.0	12	20.0	6	10.0	54	90.0	<0.001*
wearing correctly	6	26.1	17	73.9	0	0.0	60	100.0	0.031*
Frequently if present	23	38.3	37	61.7	42	70.0	18	30.0	0.031*
Eye goggles									
Wearing eye goggles during working hours	17	28.3	43	71.7	6	10.0	54	90.0	0.035*
Wearing correctly	6	12.2	43	87.8	6	10.0	54	90.0	1.000
Frequently if present	0	0.0	49	100.0	30	55.6	24	44.4	<0.001*
B. Personal monitoring devices									
Wearing personal dosimeter during work	54	90.0	6	10.0	6	10.0	54	90.0	<0.001*
wearing correctly	6	50.0	6	50.0	6	10.0	54	90.0	1.000
Frequently if present	6	50.0	6	50.0	25	46.3	29	53.7	0.031*
C. Dose control aspect									
Sit behind the wall shield during work	6	10.0	54	90.0	0	0.0	60	100.0	0.031*
wearing correctly	37	61.7	23	38.3	0	0.0	60	100.0	<0.001*
Frequently if present	54	90.0	6	10.0	25	41.7	35	58.3	<0.001*
Increase the distance from the radiation source	6	10.0	54	90.0	0	0.0	60	100.0	0.031*
use the correct distance	37	61.7	23	38.3	0	0.0	60	100.0	<0.001*
Frequently if present	17	28.3	43	71.7	12	20.0	48	80.0	0.458

Table (5): Distribution of the studied nurses according to overall workplace Observation and nurses' protective measures (n=60)

The overall score for workplace Observation	Pre (n=60)	Post (n=60)	**Z**	p
Min. – Max. Mean ± SD. Median	0.0 – 55.0 32.38 ± 13.05 31.0	54.0 – 61.0 57.10 ± 1.99 58.0	6.411*	<0.001*
Overall score for nurses' protective measures				
Min. – Max.	0.0 – 17.0	13.0 – 21.0	6.066*	<0.001*
Mean ± SD.	9.20 ± 4.05	16.47 ± 2.32		
Median	9.0	17.0		

DISCUSSION

The subject "Human responses to medical use of radiation" was added to the list of fundamental concepts. The objective was to provide nurses with a deeper understanding of the medical applications of radiation, the effects of radiation on the human body, the hazards and health impacts of radiation, and radiation protective strategies for medical workers. Therefore, it is essential to look at how radiation education is incorporated into basic nursing education to determine the level of nurses' scientific understanding of radiation and to guarantee best practices of care (Yoshida et al. 2020).

Concerning studied nurses attending radiation therapy training courses, the present study revealed that more than half of the studied nurses received training programs about radiation safety, the findings of the current study are consistent with(Badawy et al. 2016; Park and Yang 2021; Rostamzadeh, Farzizadeh, and Fatehi 2015) who found that the majority of participants attended the training courses. However, this finding was in disagreement with (Maina, Motto, and Hazell 2020) which found that the minority of the participants received a training program.

From the researcher's point of view, this may be due to the department's failure to create any training programs for the staff. Attending seminars was linked to a healthcare professional's knowledge. The likelihood of right answers rose with participation in any radiation education procedure and with participants reading published information on radiation protection, conferences multidisciplinary clinical meetings, academic pursuits, and research are major sources of this information acquisition.

Regarding the hazards arising from radiation overexposure, the current study found a notable disparity between the pretest and posttest results regarding cancer, blood disorders (anemia, leukemia), recurrent miscarriages, skin burns, premature aging, and birth defects. However, there was no significant difference observed before and after the protocol in terms of hair loss, cataracts, and sterility. Similar findings reported by (Girgin 2021) who found a significant difference between the pretest and posttest, Also,(Eliwa, Sorour, and Mahmoud 2018) who declared that half of the nurses suffered from blood problems, predominantly anemia. These findings can be attributed to the extensive duration of radiation therapy practice, considering the risk factors associated with occupational diseases.

Regarding the compliance of studied nurses about the As Low As Reasonably Achievable (ALARA) principle of dose control, the findings of the present study revealed that there was a significant difference between the pretest and posttest (shielding, distance, and time) related to similar findings reported by (Kumar et al. 2021) who stated that knowledge about ALARA improved and there was a notable disparity between the pretest and posttest.

Also, (Harris et al. 2019) found that the majority of the participants knew decreasing time and wearing protective materials decreased exposure. While only fifty of them knew about the correct distance and exposure. In contrast ((Omar et al. 2021) who revealed that The ALARA principle was known by less than fifty of the respondents.

Concerning protective practices of nurses occupationally exposed to ionizing radiation the current study results showed that there was a statistically significant difference between nurses pre/post protocol implementation related personal protective equipment (wearing a lead apron, lead gloves, thyroid shields, eye goggles), personal monitoring devices as a dosimeter and dose control aspect. From the researcher's point of view, This difference may have resulted from the nurses receiving training courses for using this protective equipment, and the safety officer being responsible for providing supervision when using personal protective equipment, these findings are compatible with (Ahmed et al. 2022) who demonstrated that there was a statistical difference between pre and post-training Programs.

Also, participants indicated significant improvement in using of lead apron, and thyroid shield, and there was a minimal increase in the use of a dosimeter, but it was also statistically significant done by (Kumar et al. 2021) who noted that the application of radiation safety precautions declined once more after a few months. Therefore, it is crucial to emphasize the regular organized education program at regular intervals to reinforce the daily practice of health care professionals, given the large influence of education programs and deterioration after a time gap.

Contradictory, these findings disagreed with (Fiagbedzi et al. 2022) who found that staff nurses and other members of the radiology team, had insufficient practice in implementing safety measures for radiation exposure. This deficiency is serious and poses a significant risk when working with ionizing radiation.

CONCLUSION

Based on current study findings, it can be concluded that

Nurses' levels of protective measures practices for radiotherapy had improved after the implementation of the safety protocol**.**

RECOMMENDATIONS

Establish a health education program at each specialist cancer center, staffed by a certified and trained nurse who is always available. Furthermore, it is imperative to arrange weekly gatherings to provide personnel with counseling and address health-related issues, also promote the participation of nurses in national and international conferences, workshops, and ongoing training courses endorsed by the Ministry of Health that focus on radiation protection measures.

References

Ahmed, Manal, Hoda Diab, and Soad Sharkawy. 2022. "In Service Training Program about Radiation Safety Measures among Nurses and Technicians at Main Assuit University Hospital." *Assiut Scientific Nursing Journal* 10(28.):10–20. doi: 10.21608/asnj.2022.114669.1294.

Ahmed, Manal, Hoda Fahmy, and Soad Sharkawy. 2021. "Assessment of Nurses & Technicians' Knowledge and Practices about Radiation Hazards and It's Safety Measures at Main Assuit University Hospital." *Assiut Scientific Nursing Journal* 9(26):10–20. doi: 10.21608/asnj.2022.105511.1264.

Badawy, Mohamed Khaldoun, Kam Shan Mong, U. Paul Lykhun, and Pradip Deb. 2016. "An Assessment of Nursing Staffs' Knowledge of Radiation Protection and Practice." *Journal of Radiological Protection* 36(1):178–83. doi: 10.1088/0952-4746/36/1/178.

Durduran, Yasemin, Mehmet Ay, Lutfi Demir, Mehmet Uyar, Ömer Kayapınar, Mehmet Özdemir, Yusuf Boyraz, and Tahir Kemal Şahin. 2018. "The Factors Affectıng the Occupational Health-Safety Practice of the Hospital Workers with the Knowledge-Attention Status." doi: 10.21276/sjbr.2018.3.4.4.

El-Feky, AsmaaA, RaniaM El-Sallamy, AliA El-Sherbeni, and Hagras El-Mursi Hagras. 2017. "Safety Measures among Workers Occupationally Exposed to Ionizing Radiation in Tanta University Hospitals." *Tanta Medical Journal* 45(4):166. doi: 10.4103/tmj.tmj_29_17.

Eliwa, S. .., A. .. Sorour, and S. .. Mahmoud. 2018. "Occupational Health Hazards and Protective Measures among Radiation Health Team." *Zagazig Nursing Journal* 14(2):48–61.

Fiagbedzi, Emmanuel, Philip Nii Gorleku, Savanna Nyarko, Adomako Asare, and Gideon Ackah Ndede. 2022. "Assessment of Radiation Protection Knowledge and Practices among Radiographers in the Central Region of Ghana." *Radiation Medicine and Protection* 3(3):146–51. doi: 10.1016/j.radmp.2022.06.001.

Girgin, Reha. 2021. "An Anatolian Study on the Current Knowledge and Attitudes of Urology Operating Room Staff on Ionizing Radiation." *African Journal of Urology* 27(1):21. doi: 10.1186/s12301-020-00117-7.

Harris, Andrew M., John Loomis, Marilyn Hopkins, and Jason Bylund. 2019. "Assessment of Radiation Safety Knowledge Among Urology Residents in the United States." *Journal of Endourology* 33(6):492–97. doi: 10.1089/end.2019.0133.

IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.

Kumar, Vijay, Atanu Kumar Pal, Sreerag Ks, Ramanitharan Manikandan, Lalgudi N. Dorairajan, Sidhartha Kalra, Saravanan Kandasamy, and Mujahid Khan. 2021. "Effect of Structured Educational Program on Practices of Radiation Safety Measures Among Health Care Providers in Urology Operation Theater." *Cureus*. doi: 10.7759/cureus.15765.

Lee, Su Jin, Sunjoo Boo, Jeong-Ah Ahn, and Mi-Ae You. 2020. "Factors Affecting Radiation Protection Behaviors among Emergency Room Nurses." *Journal of Korean Critical Care Nursing* 13(1):15–26. doi: 10.34250/jkccn.2020.13.1.15.

Maharjan, Surendra, Kalpana Parajuli, Suraj Sah, and Upakar Poudel. 2020. "Knowledge of Radiation Protection among Radiology Professionals and Students: A Medical College-Based Study." *European Journal of Radiology Open* 7:100287. doi: 10.1016/j.ejro.2020.100287.

Maina, Patrick Muiga, Jennifer Anne Motto, and Lynne Janette Hazell. 2020. "Investigation of Radiation Protection and Safety Measures in Rwandan Public Hospitals: Readiness for the Implementation of the New Regulations." *Journal of Medical Imaging and Radiation Sciences* 51(4):629–38. doi: 10.1016/j.jmir.2020.07.056.

Marshall, Suphalak Khamruang, Piyatida Prom-on, Siriluck Sangkue, and Wasinee Thiangsook. 2023. "Assessment of Radiation Exposure in a Nuclear Medicine Department during 99mTc-MDP Bone Scintigraphy." *Toxics* 11(10):814. doi:

10.3390/toxics11100814.

Omar, Mohamed, Esam E. A. Desoky, Basheer Elmohamady, Alaa El-Shaer, and Yasser A. Noureldin. 2021. "Awareness and Implementation of Lonizing Radiation Safety Measures among Urology Community in Egypt: Nationwide Survey." *African Journal of Urology* 27(1):13. doi: 10.1186/s12301-020-00110-0.

Park, Sookkyoung, and Yaki Yang. 2021. "Factors Affecting Radiation Protection Behaviors among Emergency Room Nurses." *International Journal of Environmental Research and Public Health* 18(12):6238. doi: 10.3390/ijerph18126238.

Rostamzadeh, Ayoob, Mohammad Farzizadeh, and Daryoush Fatehi. 2015. "Radiological Protection in Kermanshah Iran." *Iranian Journal of Medical Physics* 12(3).

Shati Qutbi, Huda Ashur, Taqi Mohammed Jwad Taher, and Sahar Ahmed Mahdi. 2021. "KNOWLEDGE ABOUT RISK AND PROTECTIVE MEASURES RELATED TO DIAGNOSTIC RADIATION AMONG MEDICAL STAFF IN TEACHING HOSPITALS (WASIT PROVINCE)." *Wiadomości Lekarskie* 74(9):2345–51. doi: 10.36740/WLek202109216.

Vañó, E., D. L. Miller, C. J. Martin, M. M. Rehani, K. Kang, M. Rosenstein, P. Ortiz-López, S. Mattsson, R. Padovani, and A. Rogers. 2017. "ICRP Publication 135: Diagnostic Reference Levels in Medical Imaging." *Annals of the ICRP* 46(1):1–144. doi: 10.1177/0146645317717209.

Yoshida, Midori, Saori Iwamoto, Reiko Okahisa, Sachi Kishida, Minoru Sakama, and Eiichi Honda. 2020. "Knowledge and Risk Perception of Radiation for Japanese Nursing Students after the Fukushima Nuclear Power Plant Disaster." *Nurse Education Today* 94:104552. doi: 10.1016/j.nedt.2020.104552.

تأثير بروتوكول سلامة العلاج الإشعاعي على ممارسات التدابير الوقائية لممرضي الأورام

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الخلاصة

زيادة التعرض للإشعاعات المؤينة يعرض الممرضات والمرضى لمخاطر صحية. يمكن أن يساعد الالتزام باحتياطات السلامة في تقليل مخاطر الحوادث المتعلقة بالصحة. الهدف: هدفت هذه الدراسة. تقييم تأثير بروتوكول سلامة العلاج الإشعاعي على ممارسات التدابير الوقائية لممرضي الأورام . تصميم الدراسة: تم استخدام تصميم البحث شبه التجريبي (مجموعة واحدة قبلي وبعدي) في الدراسة الحالية لتحقيق هدفها. مكان الدراسة: أجريت هذه الدراسة في قسم الأورام والطب النووي بمستشفى المنصورة ومستشفى دمياط لعلاج السرطان. العينه :عينة مناسبة من الممرضات المتاحات العاملات في الأماكن المذكورة سابقًا (60) ممرضة. أدوات جمع البيانات أداتان تستخدمان لجمع البيانات. قائمة مراجعة المراقبة في مكان العمل وقائمة مراجعة المراقبة الخاصة بالممرضات. النتائج كانت معظم مجالات التحسين هي ارتداء تدابير وقائية مثل درع الغدة الدرقية وأجهزة مراقبة الأفراد تراوحت ما بين (20%) و(10%) الي (90.0٪) والإبلاغ عن المخاطر التي قد تحدث من الإشعاع مثل السرطان وتغيرات الدم قد تغيرت من (60,0%) ,(48.3%) الي (100%)بعد تطبيق البرتكول. الاستنتاج: تحسنت مستويات ممارسات التدابير الوقائية للعلاج الإشعاعي لدى الممرضات بعد تنفيذ بروتوكول السلامة. التوصيات: عقد المزيد من الدورات التدريبية الأساسية والحديثة اللازمة لتحسين ممارسات سلامة الموظفين والأداء الجيد.

الكلمات المرشدة: بروتوكول أمان العلاج الإشعاعي، ممرضات الأورام، الممارسات الوقائية.