Scientific Research Publishing

Open Journal of Nursing, 2025, 15(11), 1037-1047
https://www.scirp.org/journal/ojn
ISSN Online: 2162-5344
ISSN Print: 2162-5336

Nursing Interventions for Radiation Therapy Side Effects in Breast Cancer Patients

Marwan Abdualmajeed Manajreh[1*], Yousaf Saleh Alawi[1], Bandar Al Qahtani[1], Amnah Farhan Aluneizi[2], Huda Sulaiman Alhawiti[2], Fatimah Swalim Al Daqiqi[2], Jensa Eleanor Lim[2], Abdullah Saeed Salem Alzahrani[2], Dari Abdalaziz Mahmoud Almahmoud[3], Majed Thuwahir Salem Albalawi[3], Waleed Rayif Bajjah Alr Ashidi[3]

[1]Research Department, King Salman Armed Forces Hospital, Tabuk, Saudi Arabia
[2]Nursing Department, King Salman Armed Forces Hospital, Tabuk, Saudi Arabia
[3]Pharmacy Department, King Salman Armed Forces Hospital, Tabuk, Saudi Arabia
Email: *Marwan_Manajreh@yahoo.com

How to cite this paper: Manajreh, M.A., Alawi, Y.S., Al Qahtani, B., Aluneizi, A.F., Alhawiti, H.S., Al Daqiqi, F.S., Lim, J.E., Alzahrani, A.S.S., Almahmoud, D.A.M., Albalawi, M.T.S. and Ashidi, W.R.B.A. (2025) Nursing Interventions for Radiation Therapy Side Effects in Breast Cancer Patients. *Open Journal of Nursing*, **15**, 1037-1047.
https://doi.org/10.4236/ojn.2025.1511073

Received: October 23, 2025
Accepted: November 22, 2025
Published: November 25, 2025

Abstract

Background: Radiation therapy for breast cancer frequently leads to side effects such as fatigue, skin reactions, pain, lymphedema, sleep disturbances, and psychological distress. Nursing interventions, including evidence-based care, targeted skin management, education, and psychological support, are effective in reducing radiation therapy side effects and improving the quality of life for breast cancer patients. **Objective:** To assess the effectiveness of nursing interventions for breast cancer patients in reducing radiotherapy-related side effects. **Methods:** This cross-sectional study was conducted at the Department of Oncology, King Salman Armed Forces Hospital in the North Western region of Saudi Arabia. A total of 60 patients were included in the study. Patient selection was based on diagnosed patients with breast cancer who were planned to undergo radiotherapy. Nursing interventions were delivered through structured protocols targeting common side effects. These included patient education on evidence-based skin care regimens, counseling on fatigue management strategies, as well as early detection and management of lymphedema through education on arm care, compression therapy, and referral to physiotherapy when indicated. Fatigue was measured using the Brief Fatigue Inventory (BFI), and skin-related quality of life was assessed using the Dermatology Life Quality Index (DLQI). All data were entered into SPSS version 25 for analysis. **Results:** In this study, the most commonly reported side effects among breast cancer patients receiving radiation therapy were skin irritation (93.3%), fatigue (91.6%), and lymphedema (53.3%). In this study, skin care interventions were effective in 62.8% of patients, fatigue management strategies in 66.7%, and for lymphedema in 60.9%, whereas psychological support interventions

had the highest effectiveness, benefiting 75% of patients. A very weak negative correlation was seen between the DLQI score and the BFI score. Both these scores showed no significant difference in terms of age, stage of breast cancer, and duration of radiotherapy. **Conclusion:** The results of this study suggest that the most frequent side effects experienced by breast cancer patients undergoing radiation therapy were skin irritation, followed by fatigue and lymphedema. Nursing interventions showed moderate to high effectiveness, particularly in addressing psychological symptoms, fatigue, skin issues, and lymphedema. However, shortcomings such as inadequate training, lack of standardized care protocols, and insufficient patient education and follow-up were observed.

Keywords

Breast Cancer, Radiation Therapy, Side Effects, Nursing Intervention, Saudi Arabia

1. Introduction

Breast cancer has emerged as the most common type of malignancy among women worldwide and the 2nd most common cause of mortality among them. In Saudi Arabia, breast cancer stands as the predominant type of female malignancy with a 53% prevalence in the region [1]. Various types of treatment modalities have been reported for breast cancer.

Radiotherapy is one of the core treatment modalities with proven efficacy for early and advanced stage breast cancer cases. Although most patients tolerate it well, side effects are common [2]. Breast cancer patients undergoing radiotherapy may experience a variety of side effects including difficulty swallowing, sore throat, cough, weakness, loss of appetite, skin sensitivity, discomfort, pain, skin reactions, lymphedema, and psychological distress [2] [3]. All these side effects can have a negative impact on the quality of life of patients and treatment compliance [4]. Nurses play a crucial role in identifying, preventing, and formulating management plans for treatment-related side effects in consultation with the treating physicians [5] [6]. Evidence-based nursing (patient education on self-care, psychological support, and patient care planning) practices have been shown to significantly impact the minimization of treatment-related side effects, overall improvement in quality of life, enhancement of patients' psychological stability, and increased patient satisfaction [6] [7].

Strategies for healthcare professionals, caregivers, and patients should focus on minimizing nausea/vomiting, protecting mucosa, preventing catabolic states, and fostering strong therapeutic relationships among patients, caregivers, and oncologists [8]. Overall, effective toxicity reduction requires proactive, team-based approaches such as anticipatory guidance, close monitoring, and patient-reported outcomes [9]. The HQN intervention has shown strong effectiveness in nasopharyngeal carcinoma patients receiving radiotherapy, enhancing treatment efficacy,

reducing adverse effects, improving health awareness, emotional well-being, sleep quality, quality of life, and overall nursing satisfaction [10].

Given the high burden of radiation-induced side effects among breast cancer patients and their significant impact on quality of life, the role of effective nursing management becomes crucial. The nurses' role is of core importance as they provide evidence-based interventions in terms of educating patients and providing emotional and psychological support to minimize the adverse effects experienced by patients. Keeping in mind the importance and lack of local data in this regard, we planned this study to evaluate the effectiveness of different nursing interventions in our clinical settings for radiotherapy-related side effects among breast cancer patients at Prince Sultan Oncology Center, King Salman Armed Forces Hospital in the Northwestern region.

2. Method

This cross-sectional study took place at the Prince Sultan Oncology Center, part of King Salman Armed Forces Hospital in Tabuk, Saudi Arabia. Inclusion criteria for the patients were adult women (>18 years, willing to give informed consent) diagnosed with breast cancer who had completed their radiation therapy. Women with other significant co-morbidities, who underwent other interventions, and who were not willing to participate in the study were excluded. The sample size for the study was 60, which was calculated with the following parameters: 80% confidence level, an anticipated 50% prevalence of radiation-related side effects, and an 8% margin of error. All patients were given a brief overview of the study with all possible risks and benefits associated with the study. Patients were assured that the confidentiality of their data would be maintained and that it would be used for research purposes only. Patients' demographic and medical history were noted down by the nursing staff. The nursing staff followed the institutional protocols and guidelines as interventions for managing radiotherapy-related side effects among patients. The nursing intervention comprises evidence-based skin care counseling and information, strategies to be used for fatigue-related symptoms and morbidity, light exercise, resting schedule, recognition of lymphedema and related care, compression, and referrals to physical therapy as needed by the patients. A small booklet was prepared for the patients which included all the information regarding treatment modalities, their associated side effects, and related modalities for rehabilitation to meet patients' needs in order to improve and relieve the patient in case any side effects appeared post radiation therapy.

They also offered emotional support through regular check-ins and monitoring of symptoms. Psychological support interventions included weekly one-on-one counseling sessions conducted by trained oncology nurses focusing on coping strategies, emotional expression, and relaxation techniques. Nurses used informal symptom checklists to identify signs of distress such as anxiety, sleep disturbance, or low mood. Psychological distress was also indirectly evaluated through patient feedback collected during counseling sessions and follow-up interviews, which informed the ratings of intervention effectiveness. We ensured these interventions

were consistent for everyone by standardizing their content and frequency. Data collection was conducted after patients completed their therapy. To facilitate data collection, local nurses who could speak Arabic and English were selected. Validated and reliable questionnaires were used for the assessment of symptom severity. For fatigue assessment, the Brief Fatigue Inventory questionnaire was used. It is a 9-item scale validated by Mendoza *et al.* This tool effectively assesses the intensity as well as the impact of fatigue on daily life activities [11]. To assess skin-related issues, a validated and reliable tool, "The Dermatology Life Quality Index", was used. This tool helps in the assessment of the impact of dermatological conditions, such as pruritus, pain, and general discomfort, on patients' quality of life [12].

To evaluate the perceived effectiveness of each nursing intervention (skin care, fatigue management, lymphedema care, and psychological support), patients were asked a single-item question after completing radiotherapy: "How effective do you think the nursing interventions were in managing your side effects?" Responses were recorded on a 4-point Likert scale: 1 = Not effective, 2 = Slightly effective, 3 = Moderately effective, and 4 = Very effective.

Data entry and analysis were carried out with SPSS version 25. Quantitative data (BFI and DLQI scores) were presented as mean ± SD/median (IQR), and qualitative data were presented with frequency and percentage. The normality of the data was assessed with the Shapiro-Wilk test. The Kruskal-Wallis H test was used to compare patient characteristics. The correlation coefficient was calculated between the DLQI score and the BFI score. A p-value < 0.05 was considered statistically significant. Ethical approval was sought from the Institutional Review Board of King Salman Armed Forces Hospital in Tabuk, Kingdom of Saudi Arabia (IRB-Number: KSAFH-RET-2024-592). All participants provided written informed consent, and data confidentiality was maintained through anonymized coding and secure data storage. Participants were assured that declining participation or withdrawing at any point will not affect their treatment. This study was designed to pose minimal risk, as the nursing interventions align with standard supportive oncology care.

3. Results

Most participants were in the age group 41 - 50 years (31.7%), followed by the age group 51 - 60 years (25%). Among patients, 75% were married, 28.3% had a bachelor's degree, and 30% of the patients had some college education. Disease stage was dominated by Stage I (38.3%) and Stage II (38.3%), with Stage III (20%) and Stage IV (3.3%) less common. For radiotherapy duration, 63.3% of patients had a duration of therapy of 3 - 4 weeks, followed by 28.3% who had therapy for 4.1 - 5 weeks, and only 8.3% had therapy for 5.1 - 6 weeks. The mean (SD)/median (IQR) BFI (The Brief Fatigue Inventory) and DLQI (Dermatology Life Quality Index) scores for the patients were 5.05 ± 1.95 [5.41 (2)] and 5.48 ± 2.97 [5 (4.75)], respectively. BFI and DLQI scores were compared across all patient characteristics.

No significant difference was seen for median BFI and DLQI scores in relation to age, stage, and duration of radiotherapy (Table 1). Figure 1 shows the severity of side effects among patients (Figure 1). Table 2 shows the nursing intervention in relation to effectiveness. For skin care intervention, 62.8% of patients reported effectiveness (slight, moderately, and very effective); for fatigue-related intervention, 66.7% of patients reported effectiveness of intervention (slight, moderately, and very effective); for lymphedema, 60.9% of patients reported effectiveness (slight, moderately, and very effective); and for psychological intervention, 75% of patients reported effectiveness (slight, moderately, and very effective) (Table 2). Figure 2 shows a very weak negative correlation between DLQI score and BFI score, *i.e.*, r = −0.124, p-value = 0.341 (Figure 2).

Table 1. Patients' characteristics in relation to BFI and DLQI Score (n = 60).

	Frequency	%	BFI Score	DLQI Score
			Median (IQR)	Median (IQR)
Age				
18 - 30 Years	11	18.3%	5.45 (3)	4 (6)
31 - 40 Years	15	25%	5.66 (4)	6 (3)
41 - 50 Years	19	31.7%	5.15 (2)	5 (3)
51 - 60 Years	15	25%	5.42 (2)	5 (7)
p-value(ζ)			**0.423**	**0.835**
Marital Status				
Divorced	3	5%	3.42 (-)	9 (-)
Married	45	75%	5.44 (2)	5 (5)
Single	9	15%	5.45 (2)	6 (4)
Widowed	3	5%	3.03 (-)	5 (-)
p-value(ζ)			**0.282**	**0.120**
Education				
Bachelor's degree	17	28.3%	5.17 (2)	5 (4)
Graduate degree	6	10.0%	5.10 (4)	8 (9.25)
High school or less	19	31.7%	5.40 (3)	4 (5)
Some college	18	30.0%	5.44 (2)	6 (4.25)
p-value(ζ)			**0.874**	**0.323**
Occupation				
Employed full-time	28	46.7%	5.44 (3)	5 (3.75)
Employed part-time	13	21.7%	5.04 (2)	6 (4)
Retired	4	6.7%	4.28 (4)	3.50 (3.75)
Unemployed	13	21.7%	5.48 (2)	8 (8.50)
Other	2	3.3%	5.40 (-)	7 (0)
p-value(ζ)			**0.672**	**0.299**

Continued

Stage of Breast Cancer				
Stage I	23	38.3%	5.44 (10)	5 (4)
Stage II	23	38.3%	4.98 (2)	6 (5.50)
Stage III	12	20.0%	5.45 (5)	5 (4)
Stage IV	2	3.3%	5.61 (-)	5 (-)
p-value(ξ)			**0.366**	**0.790**
Type of Radiotherapy				
Brachytherapy	7	11.7%	5.44 (4)	5 (6)
External beam radiation	51	85.0%	5.40 (2)	5 (4)
Other	2	3.3%	7.10 (-)	5.50 (-)
p-value(ξ)			**0.412**	**0.909**
Duration of Radiotherapy				
3 - 4 Weeks	38	63.3%	5.41 (2)	6 (5.25)
4.1 - 5 Weeks	17	28.3%	4.81 (3)	5 (4)
5.1 - 6 Weeks	5	8.3%	5.57 (3)	6 (6)
p-value(ξ)			**0.135**	**0.967**
Side Effects				
Skin Irritation	56	93.33%	5.34 (2)	6 (4)
Fatigue	55	91.67%	5.39 (2)	5 (4)
Lymphedema	32	53.33%	5.18 (2)	5 (4.75)
Pain	49	81.67%	4.30 (3)	5 (4)
Appetite Change	42	70%	5.44 (2)	5 (4.50)
Sleep Disturbance	52	86.67%	5.44 (2)	5 (4.75)
Psychological Distress	56	93.33%	5.44 (2)	5 (4)
Overall Quality of Life				
Poor	4	6.7%	6.85 (3)	7 (6.50)
Fair	41	68.3%	5.44 (2)	6 (4)
Good	15	25%	3.03 (4)	4 (5)
p-value(ξ)			**0.175**	**0.316**
Support from Healthcare Providers				
Poor	16	26.7%	5.45 (3)	4.50 (4.50)
Fair	24	40%	4.93 (3)	6 (4.75)
Good	20	33.3%	5.34 (2)	5.50 (5.50)
p-value(ξ)			**0.181**	**0.272**

Note: Kruskal Wallis H Test.

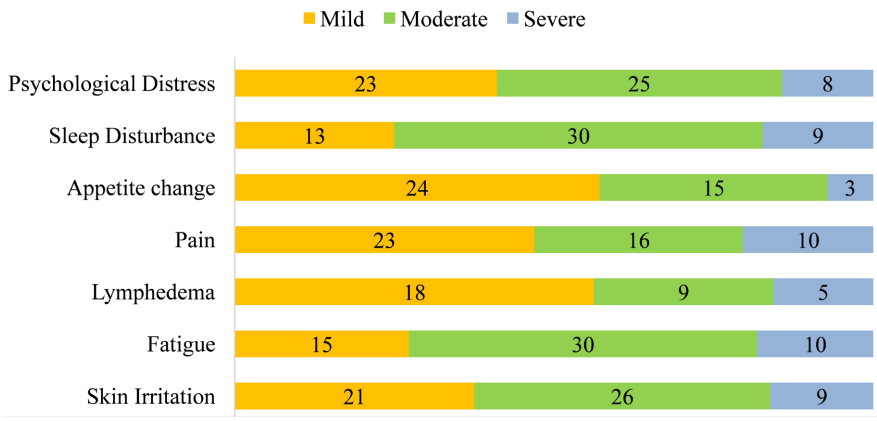

Figure 1. Severity of side effects.

Table 2. Effectiveness of nursing intervention for side effects.

	Nursing Intervention			
	Skin Care	**Fatigue**	**Lymphedema**	**Psychological**
Not effective	16 (37.2%)	16 (33.3%)	9 (39.1%)	5 (25%)
Slightly Effective[a]	11 (25.6%)	16 (33.3%)	1 (4.3%)	8 (40%)
Moderately Effective[b]	6 (14%)	10 (20.8%)	5 (21.7%)	4 (20%)
Very Effective[c]	10 (23.3%)	6 (12.5%)	8 (34.8%)	3 (15%)
Effective (a + b + c)	62.8%	66.7%	60.9%	75%
Total	**43**	**48**	**23**	**20**

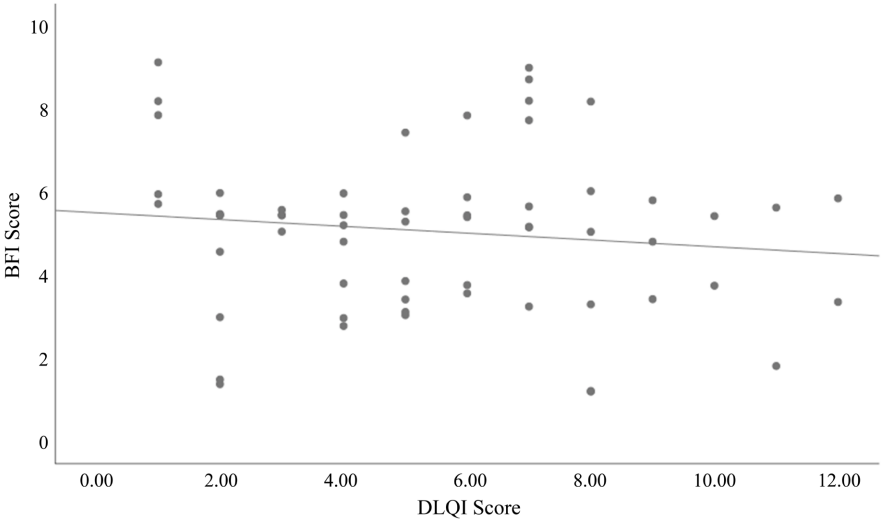

Figure 2. Scatter plot between BFI and DLQI Score.

4. Discussion

In this study, the most commonly reported side effects among breast cancer pa-

tients receiving radiation therapy were skin irritation (93.3%), fatigue (91.6%), and lymphedema (53.3%). Batenburg *et al.* reported that 18% experienced breast firmness, 14% reported chest wall pain, 10% developed breast pain, and 7% had lymphedema [13]. However, the lower percentages reported in their study may be attributed to the use of hypofractionated radiation therapy regimens, which are associated with reduced tissue toxicity. Hauth *et al.* found no significant overall change in the severity of fatigue during radiation therapy; however, a mild decline in physical well-being was noted (p-value = 0.007), and importantly, fractionation type did not influence fatigue outcomes [14].

The overall quality of evidence regarding nursing interventions remains limited. While few studies demonstrate strong designs and higher levels of evidence, the available research is insufficient and lacks the rigor needed to effectively guide and support evidence-based, patient-centered nursing care [7]. Similarly, in this study, inadequate patient education (30%) and poor support form health care providers (26.7%) were identified as major gaps in current approaches. A review by Drury *et al.* also highlighted a scarcity of specialized educational programs in advanced breast cancer nursing, showing deficiencies in design, implementation, and evaluation, with minimal application of educational standards, theoretical frameworks, or patient and public input in their development [15]. However, among 139 patients surveyed by Rodriguez-Ortega *et al.*, 99.3% stated that the breast care nurse provided accurate information, and 97.8% reported that the BCN's support helped them feel emotionally better [16]. A study conducted by Qasim *et al.* in Saudi Arabia confirms that the instructional program had a strong positive impact on enhancing awareness and understanding of radiation therapy among patients receiving it for the first time [17]. Seol *et al.* observed that, immediately after treatment, financial difficulties were associated with reduced quality of life ($p = 0.010$); the presence of chronic disease ($p = 0.002$) and increased severity of nausea and vomiting ($p = 0.014$) were also related to lower quality of life [18]. Coroneos *et al.* found that greater financial toxicity was significantly associated with reduced psychosocial well-being and overall quality of life among breast cancer patients [19].

A total of 31 trials were reviewed by Chen *et al.*, and no significant differences were observed between nurse-led surveillance care and physician-led or routine discharge care across general outcomes. However, interventions focused on teaching, guidance, and counselling showed beneficial effects in 63% of studies, while case management interventions demonstrated positive results in 100% of cases, particularly in reducing symptom burden during treatment and survivorship [20]. Similarly, in our study, skin care interventions were effective in 62.8% of patients, fatigue management strategies in 66.7%, and for lymphedema in 60.9%, whereas psychological support interventions had the highest effectiveness, benefiting 75% of patients. Zhan *et al.* demonstrated that evidence-based nursing interventions were highly beneficial, yielding a 98% patient satisfaction rate versus 82% in the control group [6]. However, in the current study, no comparison group was made. Kim and Park found that post-procedure anxiety and depression levels were sig-

nificantly higher among married (p-value = 0.022), non-religious (p-value = 0.005) patients, and those with higher monthly income (p = 0.041) [21].

In the current study, patient satisfaction was not evaluated; furthermore, no comparison was done with a control group, and details regarding radiation dose and fractionation were also not documented, which could have affected the nature and intensity of the side effects reported. Future studies incorporating comparative designs and longer follow-up periods are needed to confirm and enhance the validity of these results.

5. Conclusion

The study suggests that the most common radiation therapy-related side effects among breast cancer patients were skin irritation, fatigue, and lymphedema. Nursing interventions showed moderate to high effectiveness, particularly in addressing psychological symptoms, fatigue, skin issues, and lymphedema. However, shortcomings such as inadequate training, lack of standardized care protocols, and insufficient patient education and follow-up were observed. These results highlight the need for structured, evidence-based nursing guidelines, improved training, and comprehensive patient education to ensure consistent and high-quality care. In clinical practice, these findings emphasize the importance of prioritizing the development and implementation of standardized care protocols, especially for managing the most frequent and effectively treated side effects, to enhance patient outcomes and care consistency.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Saeed Alqahtani, W., Abdulrahman Almufareh, N., Mostafa Domiaty, D., Albasher, G., Abduallah Alduwish, M., Alkhalaf, H., *et al.* (2020) Epidemiology of Cancer in Saudi Arabia Thru 2010-2019: A Systematic Review with Constrained Meta-Analysis Running Title: Epidemiology of Cancer in Saudi Arabia Thru 2010-2019. *AIMS Public Health*, **7**, 679-696. https://doi.org/10.3934/publichealth.2020053

[2] Temiz, G., Cankaya, G., Ozturk, A. and Ozgen, Z. (2024) Acute Side Effects and Health Care Requirements in Breast Cancer Patients Treated with Radiotherapy. *Saudi Medical Journal*, **45**, 199-204. https://doi.org/10.15537/smj.2024.45.2.20230438

[3] Di Nardo, P., Lisanti, C., Garutti, M., Buriolla, S., Alberti, M., Mazzeo, R., *et al.* (2022) Chemotherapy in Patients with Early Breast Cancer: Clinical Overview and Management of Long-Term Side Effects. *Expert Opinion on Drug Safety*, **21**, 1341-1355. https://doi.org/10.1080/14740338.2022.2151584

[4] Arsenault, J., Parpia, S., Goldberg, M., Rakovitch, E., Reiter, H., Doherty, M., *et al.* (2020) Acute Toxicity and Quality of Life of Hypofractionated Radiation Therapy for Breast Cancer. *International Journal of Radiation Oncology Biology Physics*, **107**, 943-948. https://doi.org/10.1016/j.ijrobp.2020.03.049

[5] Cloconi, C., Georgiou, C., Zamba, N., Zamboglou, C. and Ferentinos, K. (2024) Use of Radiotherapy in Advanced Breast Cancer: The Role of a Nurse. *Seminars in Oncology Nursing*, **40**, Article ID: 151567. https://doi.org/10.1016/j.soncn.2023.151567

[6] Zhang, Q., Lin, L., Zou, M., Jiang, J. and Wu, Y. (2023) Application of Evidence-Based Nursing in Postoperative Radiotherapy Care for Breast Cancer. *Precision Medical Sciences*, **12**, 177-181. https://doi.org/10.1002/prm2.12117

[7] Abreu, A.M.d., Fraga, D.R.d.S., Giergowicz, B.B., Figueiró, R.B. and Waterkemper, R. (2021) Effectiveness of Nursing Interventions in Preventing and Treating Radiotherapy Side Effects in Cancer Patients: A Systematic Review. *Revista da Escola de Enfermagem da USP*, **55**, e03697. https://doi.org/10.1590/s1980-220x2019026303697

[8] Diez de los Rios de la Serna, C., Boers-Doets, C.B., Wiseman, T., Radia, B. and Hammond, R. (2024) Early Recognition and Management of Side Effects Related to Systemic Anticancer Therapy for Advanced Breast Cancer. *Seminars in Oncology Nursing*, **40**, Article ID: 151553. https://doi.org/10.1016/j.soncn.2023.151553

[9] Anderson, P.M., Thomas, S.M., Sartoski, S., Scott, J.G., Sobilo, K., Bewley, S., *et al.* (2021) Strategies to Mitigate Chemotherapy and Radiation Toxicities That Affect Eating. *Nutrients*, **13**, Article No. 4397. https://doi.org/10.3390/nu13124397

[10] Li, C. and Duan, J. (2021) Effect of High-Quality Nursing Intervention on Psychological Emotion, Life Quality and Nursing Satisfaction of Patients with Nasopharyngeal Carcinoma Undergoing Radiotherapy. *American Journal of Translational Research*, **13**, 4928-4938.

[11] Mendoza, T.R., Wang, X.S., Cleeland, C.S., Morrissey, M., Johnson, B.A., Wendt, J.K., *et al.* (1999) The Rapid Assessment of Fatigue Severity in Cancer Patients: Use of the Brief Fatigue Inventory. *Cancer*, **85**, 1186-1196. https://doi.org/10.1002/(sici)1097-0142(19990301)85:5<1186::aid-cncr24>3.0.co;2-n

[12] Finlay, A.Y. and Khan, G.K. (1994) Dermatology Life Quality Index (DLQI)—A Simple Practical Measure for Routine Clinical Use. *Clinical and Experimental Dermatology*, **19**, 210-216. https://doi.org/10.1111/j.1365-2230.1994.tb01167.x

[13] Batenburg, M.C.T., Mink van der Molen, D.R., van der Leij, F., Doeksen, A., van Dalen, T., Schoenmaeckers, E.J.P., *et al.* (2023) Patient-Reported Symptoms of Late Toxicity in Patients with Breast Cancer Treated with Hypofractionated Radiation Therapy and the Association with Quality of Life. *International Journal of Radiation Oncology Biology Physics*, **115**, 1181-1191. https://doi.org/10.1016/j.ijrobp.2022.11.008

[14] Hauth, F., De-Colle, C., Weidner, N., Heinrich, V., Zips, D. and Gani, C. (2020) Quality of Life and Fatigue before and after Radiotherapy in Breast Cancer Patients. *Strahlentherapie und Onkologie*, **197**, 281-287. https://doi.org/10.1007/s00066-020-01700-1

[15] Drury, A., Dowling, M., Diez de los Rios de la Serna, C., Erdem, S., Aroyo, V., Wiseman, T., *et al.* (2022) Advanced Breast Cancer Education for Cancer Nurses: A Systematic Review. *Nurse Education Today*, **117**, Article ID: 105477. https://doi.org/10.1016/j.nedt.2022.105477

[16] Rodriguez-Ortega, A., Ferro, T., Ochoa-Arnedo, C., Campos, G., Valverde, Y., Medina, J.C., *et al.* (2025) The Evaluation of a Nursing Care Model for Breast Cancer: What Are Women's Priorities? *Journal of Nursing Management*, **2025**, Article ID: 8653274. https://doi.org/10.1155/jonm/8653274

[17] Qassim, S.K., Al-Fayyadh, S. and PourGhaznein, T. (2023) Efficacy of a Pre-Radiotherapy, Nurse-Led Instructional Program to Enhance the Level of Awareness of Patients Receiving Radiotherapy for First Time. *Iraqi National Journal of Nursing Specialties*, **36**, 67-79.

[18] Seol, K.H., Bong, S.H., Kang, D.H. and Kim, J.W. (2021) Factors Associated with the Quality of Life of Patients with Cancer Undergoing Radiotherapy. *Psychiatry Investigation*, **18**, 80-87. https://doi.org/10.30773/pi.2020.0286

[19] Coroneos, C.J., Lin, Y., Sidey-Gibbons, C., Asaad, M., Chin, B., Boukovalas, S., *et al.* (2021) Correlation between Financial Toxicity, Quality of Life, and Patient Satisfaction in an Insured Population of Breast Cancer Surgical Patients: A Single-Institution Retrospective Study. *Journal of the American College of Surgeons*, **232**, 253-263. https://doi.org/10.1016/j.jamcollsurg.2020.10.023

[20] Chan, R.J., Teleni, L., McDonald, S., Kelly, J., Mahony, J., Ernst, K., *et al.* (2020) Breast Cancer Nursing Interventions and Clinical Effectiveness: A Systematic Review. *BMJ Supportive & Palliative Care*, **10**, 276-286. https://doi.org/10.1136/bmjspcare-2019-002120

[21] Kim, K. and Park, H. (2021) Factors Affecting Anxiety and Depression in Young Breast Cancer Survivors Undergoing Radiotherapy. *European Journal of Oncology Nursing*, **50**, Article ID: 101898. https://doi.org/10.1016/j.ejon.2021.101898