



The Effect of E-Booklet-Based Family Support Education on Anxiety During Radiotherapy

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Abstract

Anxiety is a common psychological response among cancer patients undergoing radiotherapy due to concerns about treatment procedures, potential side effects, and uncertain outcomes. Family support plays a crucial role in reducing anxiety, while digital educational media such as e-booklets may enhance family involvement during treatment. Therefore, this study aimed to determine the effect of e-booklet-based family support education on anxiety among cancer patients undergoing radiotherapy. A pre-experimental study with a one-group pretest-posttest design was conducted at the Radiotherapy Unit of Dr. (H.C.) Ir. Soekarno Regional General Hospital, Bangka Regency, Indonesia, from March to April 2026. Twenty-eight eligible cancer patients were recruited using total sampling. Anxiety levels were assessed before the intervention (pretest) and one week after the e-booklet-based family support education (posttest). Anxiety levels were assessed before and after the intervention using the Hamilton Anxiety Rating Scale (HARS). Data were analyzed using descriptive statistics, the Shapiro-Wilk test, and the paired-samples t-test, with statistical significance set at $p < 0.05$. The mean anxiety score significantly decreased from 18.89 ± 5.29 before the intervention to 11.04 ± 3.80 after the intervention. The paired-samples t-test demonstrated a statistically significant reduction in anxiety following family support education using an e-booklet ($t = 15.222$, $p < 0.001$). Family support education delivered through an e-booklet effectively reduced anxiety among cancer patients undergoing radiotherapy. Integrating this intervention into routine oncology nursing practice may strengthen family participation and improve patients' psychological well-being during treatment. Further studies using controlled designs and larger samples are recommended to confirm these findings.

Keywords: Anxiety, Cancer, E-booklet, Family Support, Radiotherapy.

INTRODUCTION

Cancer remains one of the leading causes of morbidity and mortality worldwide and continues to pose a major public health challenge. According to the Global Cancer Observatory (GLOBOCAN) 2022, approximately 20 million new cancer cases and 9.7 million cancer-related deaths occurred globally. In Indonesia, cancer accounted for 408,661 new cases and 242,099 deaths, making it one of the leading causes of mortality in the country. National data also demonstrate an increasing cancer burden, with



the prevalence rising from 1.4 per 1,000 population in 2013 to 1.8 per 1,000 population in 2018, indicating the growing need for comprehensive cancer management and supportive nursing care.

The increasing incidence of cancer is also evident in Bangka Belitung Islands Province. Regional health reports indicate that Bangka Regency has the highest proportion of cancer cases within the province. Medical record data from Dr. (H.C.) Ir. Soekarno Regional General Hospital showed that 2,404 patients received cancer-related services in 2025, including 1,990 outpatients and 794 inpatients. Among these patients, 756 individuals (31.45%) were referred to the Radiotherapy Unit, indicating that nearly one in three patients required radiotherapy as part of their cancer treatment. These data highlight the substantial demand for radiotherapy services and emphasize the importance of comprehensive nursing interventions addressing both the physical and psychological needs of patients. One approach to addressing these needs is health education, which can improve patients' and families' understanding of cancer treatment and encourage active family participation.

Health education represents an effective strategy for improving family participation during cancer treatment. Conventional educational booklets have been shown to increase knowledge and promote supportive caregiving behaviors (Masnah & Daryono, 2022). Advances in digital technology have facilitated the development of electronic booklets (e-booklets), which provide educational information in a practical, interactive, and easily accessible format. E-booklets can be accessed repeatedly through smartphones or other digital devices, enabling patients and family members to review educational materials whenever needed and reinforcing health education beyond clinical settings (Olivia et al., 2024; Sujati et al., 2022). Improved knowledge among family members is expected to enhance their ability to provide appropriate support and reduce patients' anxiety during treatment.

Although educational interventions and family support have individually demonstrated positive effects on psychological outcomes among patients with cancer, evidence regarding family support education delivered through e-booklets for patients undergoing radiotherapy remains limited, particularly in Indonesia. Furthermore, few studies have focused on implementing digital family education in radiotherapy settings, despite the prolonged treatment schedules and psychological challenges experienced by these patients. This research gap highlights the need to evaluate innovative educational interventions that actively involve family members in supporting patients throughout radiotherapy.

This study is grounded in Hildegard E. Peplau's Interpersonal Relations Theory, which emphasizes that therapeutic interpersonal relationships and effective communication facilitate patients' adaptation to stressful situations. Educational interventions directed at family members may strengthen interpersonal support, enabling families to provide more effective emotional, informational, instrumental, and appraisal support throughout the radiotherapy process and thereby reducing patients' anxiety (Sunardi & Nursanti, 2024).

Therefore, this study aimed to determine the effect of family support education using an e-booklet on anxiety levels among cancer patients undergoing radiotherapy

METHODS

This study employed a pre-experimental design using a one-group pretest-posttest approach to evaluate the effect of family support education using an e-booklet on anxiety levels among cancer patients undergoing radiotherapy. A one-group pretest-posttest design was considered appropriate because the study aimed to assess changes in anxiety levels before and after the implementation of the intervention. This design allows each participant to serve as their own control by comparing pre-



intervention and post-intervention anxiety scores. Although the absence of a control group limits causal inference, this design is commonly used in preliminary nursing intervention studies conducted in clinical settings. The study was conducted at the Radiotherapy Unit of Dr. (H.C.) Ir. Soekarno Regional General Hospital, Bangka Regency, Bangka Belitung Islands Province, Indonesia, from March to April 2026.

The study population comprised all cancer patients undergoing radiotherapy during the study period. A non-probability total sampling technique was employed because the number of eligible patients was relatively limited. This approach ensured that all patients who met the inclusion criteria had an equal opportunity to participate, thereby minimizing sampling bias and maximizing the representativeness of the study population. A total of 28 participants were included in the study. The inclusion criteria were patients diagnosed with cancer and undergoing radiotherapy, accompanied by at least one family member, able to communicate effectively, and willing to participate by providing written informed consent. The sample size was limited by the number of eligible patients available during the study period. Although total sampling was used to include all eligible participants, the relatively small sample size may have implications for statistical power and limits the generalizability of the findings to cancer patients undergoing radiotherapy in other settings or populations. Patients with severe physical or cognitive impairment that prevented participation during data collection were excluded.

The intervention consisted of family support education using an e-booklet developed by the researcher based on current evidence in oncology nursing, family support theory, and patient education guidelines. The e-booklet contained concise text and relevant illustrations, presented in an attractive and colorful digital format to facilitate understanding and avoid monotony. It was accessible via smartphone for repeated reading during treatment. The educational content included an overview of cancer and radiotherapy, common physical and psychological responses during treatment, emotional, informational, instrumental, and appraisal support, anxiety management strategies, and practical recommendations for family involvement during radiotherapy. Prior to implementation, the content was reviewed by experts in oncology nursing to ensure its relevance, clarity, and appropriateness.

Data collection was conducted in four sequential stages. First, eligible participants were identified according to the inclusion and exclusion criteria. Second, written informed consent was obtained, followed by completion of the baseline anxiety assessment using the Hamilton Anxiety Rating Scale (HARS). Third, the educational intervention was delivered individually in a quiet consultation room within the Radiotherapy Unit. The researcher provided face-to-face education to patients and their accompanying family members for approximately 20-30 minutes using the e-booklet, facilitated discussion, answered participants' questions, and confirmed their understanding of the educational materials. At the end of the session, participants received access to the e-booklet through a QR code, enabling them to review the educational materials repeatedly using their smartphones throughout the radiotherapy period. The frequency and adherence to e-booklet use after the initial education session were not monitored. Finally, anxiety levels were reassessed one week after the intervention using the same questionnaire.

Anxiety levels were measured using a modified version of the Hamilton Anxiety Rating Scale (HARS), which consists of 14 items assessing both psychological and somatic manifestations of anxiety. Each item is rated on a five-point scale ranging from 0 (not present) to 4 (very severe), producing total scores ranging from 0 to 42, with higher scores indicating greater anxiety severity. The modified instrument had previously been validated in a study involving 74 participants, demonstrating a validity coefficient of 0.80 and satisfactory internal consistency with a Cronbach's alpha coefficient of 0.802.



Because the instrument had previously been standardized and validated, no additional validity or reliability testing was conducted in the present study.

Data were analyzed using IBM SPSS Statistics version 26.0. Descriptive statistics, including frequencies, percentages, means, standard deviations, minimum and maximum values, and 95% confidence intervals, were used to summarize participant characteristics and anxiety scores. Data normality was assessed using the Shapiro-Wilk test because the sample size was fewer than 50 participants. Since the anxiety scores were normally distributed, differences between pretest and posttest scores were analyzed using the paired-samples t-test. Statistical significance was established at $p < 0.05$.

Ethical approval was obtained from the Health Research Ethics Committee of Universitas Karya Husada Semarang (No. 070/KEP/UNKAHA/LPPM/II/2026) before data collection. Ethical principles of autonomy, beneficence, non-maleficence, justice, confidentiality, and anonymity were maintained throughout the study. Written informed consent was obtained from all participants prior to enrollment. Participants were informed about the study objectives, procedures, potential benefits, and their right to withdraw at any time without affecting their medical treatment. All personal information was kept confidential and used solely for research purposes.

RESULTS

A total of 28 cancer patients undergoing radiotherapy participated in this study. The respondents' demographic and clinical characteristics are presented in Table 1.

Table 1. Respondent characteristics (n = 28)

Variable	f	%
Age (years)		
25-35	1	3.6
36-45	9	32.1
46-55	15	53.6
>55	3	10.7
Gender		
Male	7	25.0
Female	21	75.0
Education		
No formal education	2	7.1
Primary school	6	21.4
Junior high school	3	10.7
Senior high school	10	35.7
Diploma	3	10.7
Bachelor's degree	4	14.3
Occupation		
Housewife	14	50.0
Private employee	7	25.0
Civil servant	4	14.3
Others	3	10.7
Cancer type		
Cervical cancer	10	35.7
Breast cancer	8	28.6
Nasopharyngeal cancer	5	17.9
Lung cancer	3	10.7
Rectal cancer	2	7.1
Cancer stage		
Stage I	2	7.1
Stage II	7	25.0
Stage III	17	60.7

Stage IV	2	7.1
Radiotherapy sessions		
1-10 sessions	17	60.7
11-20 sessions	11	39.3

As shown in Table 1, most respondents were aged 46-55 years (53.6%), female (75.0%), had completed senior high school (35.7%), and were housewives (50.0%). Cervical cancer was the most common diagnosis (35.7%), followed by breast cancer (28.6%). Most participants had stage III cancer (60.7%) and had undergone 1-10 radiotherapy sessions (60.7%).

Table 2. Anxiety levels before and after family support education using an e-booklet (n = 28)				
Variable	Mean $\pm$ SD	Minimum-Maximum	95% CI	p-value
Pretest	18.89 $\pm$ 5.294	5-30	16.84-20.95	<0.001
Posttest	11.04 $\pm$ 3.796	2-18	9.56-12.51	

As presented in Table 2, the mean anxiety score before the intervention was 18.89 $\pm$ 5.294 (95% CI: 16.84-20.95), with scores ranging from 5 to 30. Following family support education using the e-booklet, the mean anxiety score decreased to 11.04 $\pm$ 3.796 (95% CI: 9.56-12.51), with scores ranging from 2 to 18. These findings indicate a reduction in anxiety levels after the intervention. Statistical analysis demonstrated that the difference between pretest and posttest anxiety scores was statistically significant ($p < 0.001$).

Table 3. Comparison of anxiety scores before and after family support education using an e-booklet (paired-samples t-test)				
Variable	Mean difference	t	df	p-value
Pretest vs. Posttest	7.857	15.222	27	<0.001

The paired-samples t-test demonstrated a statistically significant difference between pretest and posttest anxiety scores ($t = 15.222$, $df = 27$, $p < 0.001$), indicating that family support education using an e-booklet significantly reduced anxiety among cancer patients undergoing radiotherapy.

DISCUSSION

This study demonstrated that family support education delivered through an e-booklet significantly reduced anxiety levels among cancer patients undergoing radiotherapy. The mean anxiety score decreased from 18.89 $\pm$ 5.294 before the intervention to 11.04 $\pm$ 3.796 after the intervention, and the paired-samples t-test confirmed that this reduction was statistically significant ($p < 0.001$). These findings indicate that structured family support education effectively enhances patients' psychological adaptation during radiotherapy. The results suggest that educating family members improves their understanding of the treatment process and strengthens their ability to provide emotional, informational, instrumental, and appraisal support, thereby reducing patients' anxiety throughout cancer treatment.

The reduction in anxiety observed in this study is consistent with previous evidence highlighting the importance of family support in oncology care. Reza et al. (2022) reported that stronger family support was associated with lower anxiety among patients with cancer, while Dewi et al. (2025) demonstrated that adequate family support significantly reduced anxiety among women undergoing chemotherapy for breast cancer. Although those studies focused on different treatment modalities, the present findings extend previous evidence by demonstrating that family support education delivered through an e-booklet is also effective for patients receiving radiotherapy. Unlike conventional educational approaches, the e-booklet enabled participants and their family members

to access educational materials repeatedly using smartphones, reinforcing learning and encouraging continuous family involvement throughout treatment.

The effectiveness of the intervention may also be explained by the role of health education in improving knowledge, self-confidence, and preparedness among patients and their families. Previous studies have demonstrated that educational media, including booklets and e-booklets, improve knowledge, self-efficacy, and readiness for medical procedures (Solikah & Waluyo, 2020; Olivia et al., 2024). Better understanding of radiotherapy procedures, expected side effects, and appropriate coping strategies may reduce uncertainty, which is one of the principal contributors to anxiety among patients undergoing cancer treatment. Furthermore, psychoeducational interventions have been shown to improve psychological well-being by strengthening coping mechanisms and encouraging active family participation throughout the treatment process (Priyanto, 2024). Therefore, the reduction in anxiety observed in this study is likely attributable not only to increased knowledge but also to improved confidence and more effective family support during radiotherapy.

International evidence further supports the potential of digital psychosocial interventions in oncology. Zhang et al. (2024), in a systematic review and meta-analysis of 65 studies involving 10,361 patients with cancer and 1,045 caregivers or partners, found that digital psychosocial interventions were commonly delivered through internet-based platforms and frequently incorporated psychoeducation and cognitive-behavioral strategies. The meta-analysis indicated that digital interventions were associated with improvements in psychosocial outcomes, including reductions in anxiety and depression symptoms. These findings are consistent with the present study, in which a smartphone-accessible e-booklet was used to provide psychoeducation and was followed by a significant reduction in anxiety among patients undergoing radiotherapy. However, the present intervention differs from many interventions included in the international review because it specifically emphasized family support as the primary educational focus rather than providing psychosocial intervention solely to patients. The e-booklet also allowed patients and family members to access the information repeatedly and independently outside direct nurse-patient interactions. Therefore, the present findings extend the international evidence by demonstrating the potential application of a simple, accessible digital psychoeducational medium to strengthen family involvement in supporting patients' psychological adaptation during radiotherapy.

The findings of this study may also be interpreted through Hildegard E. Peplau's Interpersonal Relations Theory, particularly the four phases of orientation, identification, exploitation, and resolution. During the orientation phase, therapeutic communication was established with patients and family members to explore concerns and anxiety related to radiotherapy and to introduce the purpose of family support education. During the identification phase, patients and family members recognized their informational and emotional needs and identified family involvement as an important source of support during treatment. During the exploitation phase, patients and family members actively used the e-booklet to obtain information about radiotherapy, potential treatment-related effects, and appropriate forms of emotional, informational, instrumental, and appraisal support. The e-booklet also provided an opportunity for patients and family members to discuss treatment-related concerns and apply the information to daily care. In the resolution phase, patients and family members were encouraged to access and apply the information independently throughout the radiotherapy process. Thus, the intervention was not limited to the delivery of educational information but also facilitated an interpersonal process in which patients and family members became more actively involved in managing treatment-related concerns and supporting psychological adaptation.

Following the educational intervention, anxiety levels decreased substantially, suggesting that the e-booklet helped patients and family members better understand the radiotherapy process and



appropriate coping strategies. Improved knowledge may reduce uncertainty, strengthen patients' sense of control, and facilitate psychological adaptation throughout treatment. These findings are consistent with Laely et al. (2017), who reported that inadequate understanding of treatment procedures and fear of radiation contribute to psychological distress among patients with cancer. Likewise, Olivia et al. (2024) demonstrated that e-booklet-based education improved patients' understanding and reduced anxiety before medical procedures. The ability to access educational materials repeatedly through smartphones may reinforce learning and support psychological preparedness during treatment.

The present findings also support the systematic review conducted by Priyanto (2024), which concluded that psychoeducational interventions represent an essential component of oncology nursing care by improving patients' knowledge, coping abilities, emotional well-being, and psychological adaptation. Likewise, Solikah and Waluyo (2020) reported that booklet-based education enhances patients' self-efficacy by increasing preparedness for treatment and reducing uncertainty. Greater self-efficacy enables patients to anticipate treatment procedures more confidently, thereby contributing to lower anxiety levels.

The reduction in anxiety may also have been influenced by participants' demographic and clinical characteristics. Most participants were middle-aged adults and were accompanied by family members throughout the radiotherapy process. Family accompaniment may have facilitated understanding of the educational materials and encouraged the implementation of emotional, informational, instrumental, and appraisal support in daily care. Adult participants generally possess greater cognitive maturity and life experience, enabling them to understand health information more effectively and adopt adaptive coping strategies. Consequently, the combination of structured digital education and active family involvement appears to be an effective approach to reducing anxiety among patients undergoing radiotherapy.

Although the intervention produced significant improvements, several participants continued to experience mild anxiety after the intervention. This finding suggests that anxiety among patients with cancer is multifactorial and cannot be explained solely by insufficient knowledge or limited family support. Disease stage, previous treatment experiences, fear of disease progression, treatment-related side effects, financial concerns, individual coping abilities, and psychological resilience may also contribute to persistent anxiety. Therefore, educational interventions should be integrated with comprehensive psychosocial nursing care, including therapeutic communication, psychological counseling, and continuous emotional support, to optimize psychological outcomes among patients undergoing radiotherapy.

From a nursing perspective, the findings support the integration of e-booklet-based family support education into routine oncology and radiotherapy nursing practice. As a digital educational medium, the e-booklet is practical, inexpensive, environmentally friendly, and easily accessible through smartphones, allowing patients and family members to review educational materials whenever needed. This approach may improve continuity of health education, strengthen family participation, reduce psychological distress, and enhance patient-centered and family-centered nursing care throughout the radiotherapy process. The intervention is also feasible for implementation in busy clinical settings because it requires relatively few resources while providing educational materials that remain available after face-to-face counseling has been completed.

Several limitations should be considered when interpreting the findings of this study. First, the study employed a one-group pretest-posttest design without a control group, limiting the ability to attribute changes in anxiety levels exclusively to the intervention. Second, the study was conducted in a single hospital with a relatively small sample size, which may limit the generalizability of the findings. Third,



participants' adherence to using the e-booklet outside the educational session could not be objectively monitored. Differences in the frequency of reviewing the educational materials, individual motivation, and digital literacy among patients and family members may have influenced the effectiveness of the intervention.

Despite these limitations, the findings provide meaningful evidence that family support education delivered through an e-booklet is a feasible and promising nursing intervention for reducing anxiety among patients undergoing radiotherapy. Future studies are recommended to include larger multicenter samples, randomized controlled trial designs, longer follow-up periods, and digital educational platforms equipped with usage-tracking features, such as reading-time monitoring or activity logs, to evaluate participants' adherence and better determine the relationship between intervention exposure and psychological outcomes.

CONCLUSION

Family support education using an e-booklet effectively reduced anxiety among cancer patients undergoing radiotherapy by enhancing family understanding and involvement in providing emotional, informational, instrumental, and appraisal support throughout the treatment process. These findings indicate that e-booklet-based family education is a practical, accessible, and evidence-based nursing intervention that can strengthen psychosocial support and facilitate patients' psychological adaptation during radiotherapy.

The findings support the integration of e-booklet-based family education into routine oncology nursing and radiotherapy services to promote family-centered care and improve patients' psychological well-being. Future research is recommended to include larger sample sizes, multicenter settings, and randomized controlled study designs to further evaluate the effectiveness and generalizability of this intervention across diverse populations of patients with cancer.

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