

Scientific Article

Key Insights and Implementation of a Patient-Centered Education Video For Managing Acute Radiation Dermatitis in Breast Cancer: A Single-Center Pilot Study



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Purpose: This study aimed to develop an educational tool to improve breast cancer patients' understanding of radiation therapy (RT) and analyze its usage.

Methods and Materials: A single-arm trial was conducted at a tertiary hospital in Taiwan with newly diagnosed breast cancer patients scheduled for RT. Patients viewed a 4-minute educational video explaining RT mechanisms, self-care for irradiated skin, treatment precautions, and radiation dermatitis toxicity grading. A QR code provided video access. The Skindex-16 (traditional Chinese version) questionnaire assessed skin reactions before, during, and after RT. A satisfaction survey was also administered post-RT.

Results: Of the 57 enrolled patients, 51 completed the study. Most found the video satisfactory (90.2%) and easy to understand (86.3%). The video provided emotional support (90.2%) and reduced anxiety (84.3%). Nearly all patients (96.1%) found the QR code helpful. Skindex-16 outcomes indicated increasing discomfort throughout treatment, with a significant rise midway through RT. Patient characteristics, such as age, education, occupation, and social support, were not correlated with satisfaction, emotional support efficacy, or video-watching frequency. Subgroup analysis showed no significant differences in Skindex-16 scores between conventional and hypofractionated RT. Most patients (82.4%) watched the video most frequently during the first 2 weeks of RT, with 25.5% replaying it when dermatitis worsened.

Conclusions: The in-house educational video enhanced patients' understanding of RT and provided emotional support, with efficacy unaffected by patient characteristics or fractionation. Patients valued QR code access. The timing of watching the video was crucial. Continuous, accessible educational materials were important as symptoms worsened at the first follow-up. This study paved the way for future clinical trials and educational tools for breast cancer patients in radiation oncology departments.

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Research data are stored in an institutional repository and will be shared upon request to the corresponding author.

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Introduction

Breast cancer is the most common cancer in Taiwanese women, and the incidence is still rising.¹ Among various treatment options, radiation therapy (RT) has been extensively adopted for local control and reducing recurrence and mortality.^{2,3} Despite its widespread use, many patients still lack understanding of RT, but they have high information needs about its procedures and side effects.⁴⁻⁶ Furthermore, the unmet information needs can also lead to significant psychosocial distress, resulting in longer appointments and poorer treatment outcomes.⁷ Conversely, ensuring patients are well-informed before RT can reduce stress, enhance the treatment experience, potentially increase adherence to RT, and improve quality of life.⁸⁻¹¹

While routine clinical consultations in radiation oncology departments are beneficial, the volume and complexity of information are too overwhelming for patients to fully comprehend.⁶ In today's digital age, many patients turn to the Internet for medical information. However, the resources on professional websites are also difficult for general patients to understand.¹² Recognizing these challenges, alternative educational strategies like multimedia tools were proven to be effective in improving self-reported knowledge of RT and decreasing anxiety levels.^{5,6,13,14} However, there remains a lack of comprehensive educational resources that address all stages of patient care and understanding. It is unclear when patients need these resources most and how frequently they watch them. Additionally, the correlation between the frequency of applying the resources and the severity of symptoms remains unknown.

During the pandemic and subsequent postpandemic period, the use of telemedicine, including online clinics and remote video consultations, alongside multimedia educational materials and electronic feedback questionnaires, has significantly increased. In response to these developments, populations in Taiwan rapidly adapted to employing QR codes and mobile technology for location tracking and reporting for the purpose of disease/endemic control. Although QR code scanning is not yet commonly applied in medical facilities, its adoption could be an efficient way of disseminating health education materials.

This single-arm pilot study was driven by 2 primary objectives. First, to identify the need and appropriate timing of introducing multimedia educational tools to breast cancer patients. We targeted the educational needs related to breast RT dermatitis — a condition particularly distressing to an already anxious patient demographic.^{15,16} Second, to devise and assess an effective method for the dissemination of educational resources with easy access. In this study, we collected Skindex-16 scores longitudinally and conducted a satisfaction survey. Skindex-16, a reliable tool for assessing various aspects of patients'

quality of life, provides a comprehensive understanding of patient-reported outcomes, encompassing not only symptoms but also functional and emotional aspects.

Methods and Materials

Health education video

We designed a 4-minute video in a clinical scenario of a nurse giving health education to a patient before starting RT. The video content was composed of scenario-based question-and-answer sessions between health care professionals and patients. The setting of the video took place in an outpatient examination room, where a patient (portrayed by one of our colleagues) posed questions, and our medical staff responded in a friendly and informative manner. The contents included the mechanism of RT, self-care skills for irradiated skin, activities to be avoided during the RT course, and the toxicity grading of radiation dermatitis. We also launched the video online and generated a QR code linking to the video (Fig. E1) to make it easier for patients to access. The recruited patients were asked to view the video during their first visit to the outpatient clinic.

Questionnaires

Skindex-16 (traditional Chinese version)

Skindex-16 is an effective and reliable questionnaire designed to measure the subjective severity of skin issues.¹⁷⁻¹⁹ It covers 3 major subdomains: symptoms (eg, itching, burning, and pain), emotion (eg, anxiety, frustration, and embarrassment), and function (eg, daily activities and social interactions). Each item is a statement about the impact of the skin condition. The patients respond based on their recent experience, with a 7-point numeric scale ranging from 0 (never bothered) to 6 (always bothered). Because of linguistic and cultural differences, we translated the Skindex-16 into traditional Chinese to ensure patient comprehension. We applied Cronbach's alpha to confirm the reliability of the translated version.

Satisfaction survey

We designed a satisfaction questionnaire consisting of 24 multiple-choice questions that could be completed within 5 to 10 minutes. This survey was a self-assessment of several items, including patient's level of understanding of the video content, whether they applied the knowledge gained from the video to their skincare routine, the frequency of playing/replaying the video, the most severe time point of radiation dermatitis, and their general feedback on the content of the educational material.

Single-arm clinical trial

We conducted a single-arm clinical trial in the radiation oncology department of a tertiary hospital in Taiwan, approved by the local institutional review board. The study included women aged 20 or above with newly diagnosed breast cancer scheduled for RT between December 2022 and May 2023. Patients were excluded from the study if they were unable to read or unfamiliar with using mobile devices. Patients who had received RT before were also excluded.

During their initial visit to our clinic, patients were invited to watch the health education video and complete the first Skindex-16 survey. Midway through the RT course, they were requested to fill out the second Skindex-16 survey. After completing the RT course, patients were scheduled for a clinic follow-up within 4 weeks at the physician's discretion. During their first follow-up appointment, patients completed the final Skindex-16 survey along with a satisfaction questionnaire. The entire process is depicted in a flow diagram (Fig. 1).

Statistical analysis

The Cronbach's alpha test was applied to determine the internal consistency of the questionnaires. Results for

multiple-choice questions were presented in bar charts. The 3 time points of Skindex-16 responses were depicted using line charts. Student's *t* test was used to assess differences in Skindex-16 scores at different time points and to evaluate differences in scores between subgroups using different fractionation schemes. A *P* value of less than .05 was considered statistically significant. Satisfaction survey questions were categorized, and Cramer's *V* was used to specify effect sizes for the χ^2 test. Cramer's *V* ranged from 0 (no association) to 1 (perfect association). Data were analyzed with SAS (version 9.4, SAS Institute, Cary, NC) and R (version 4.3.2, R Foundation for Statistical Computing, Vienna, Austria) software.

Results

Patient characteristics

A total of 57 women were enrolled in the study, with 51 completing the educational video and questionnaires. Participants had a mean age of 50.1 years (range, 34-70). The majority spoke Mandarin Chinese as their primary language (48 of 51 patients, 94.1%). Most patients had received college or higher education (38 of 51 patients, 74.5%). Regarding occupations, the majority worked as

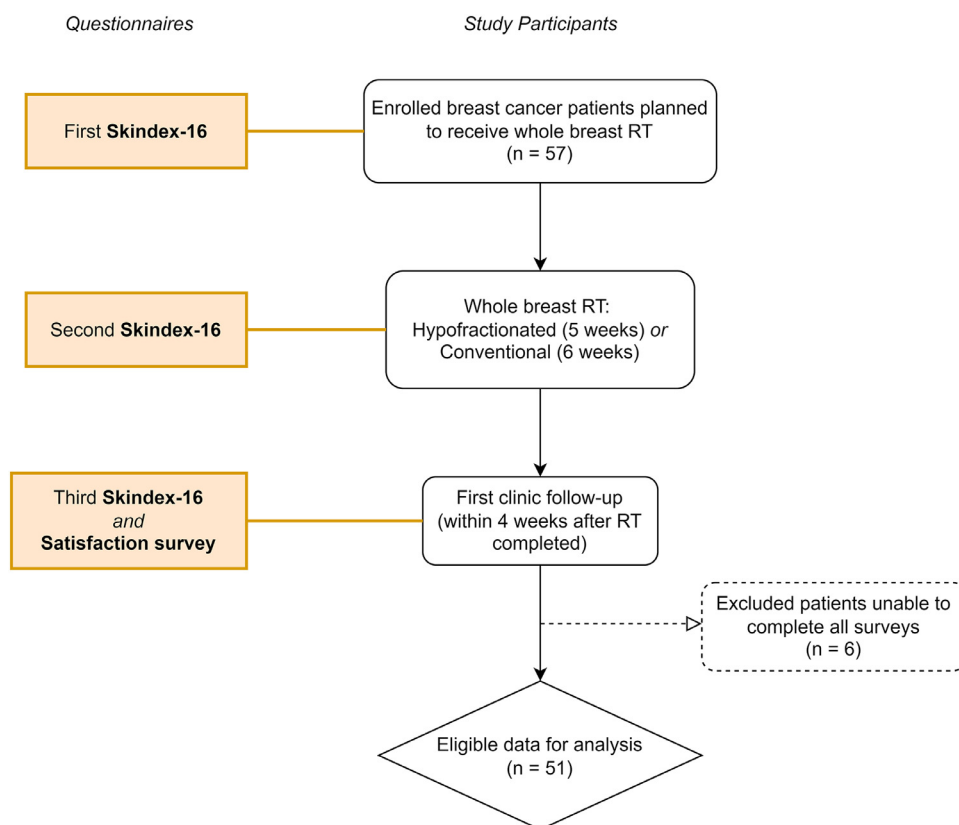


Figure 1 Flow diagram of the study design. At the first clinic visit, patients were guided by a nurse to watch a 4-minute health education video. Patients completed the Skindex-16 questionnaire at 3 time points: during the first clinic visit, midway through the radiation therapy (RT) course, and at the first clinic follow-up after the RT course ended. Additionally, a satisfaction survey was completed at the first clinic follow-up, along with the Skindex-16 questionnaire.

Table 1 Patient characteristics (N = 51)

Characteristic	n (%)
Age, y	
Mean (min, max)	50.1 (34, 70)
Main spoken language	
Mandarin Chinese	48 (94.1)
Taiwanese	3 (5.9)
Education level	
Junior high school	1 (2.0)
Senior high school	12 (23.5)
College	16 (31.4)
Bachelor's degree	17 (33.3)
Master's degree or higher	5 (9.8)
Occupation type	
Homemaker	17 (33.3)
Service industry	15 (29.4)
Business	6 (11.8)
Education	4 (7.8)
Manufacturing	2 (3.9)
Medical industry	2 (3.9)
Retired	3 (5.9)
Unemployed	2 (3.9)
Social support	
<i>Question (yes/no): "Did you tell your friends or family about your breast cancer diagnosis?"</i>	
Yes	46 (90.2)
No	5 (9.8)
<i>Question (yes/no): "Did your friends or family know that you would receive radiation therapy?"</i>	
Yes	45 (88.2)
No	6 (11.8)

homemakers (17 of 51 patients, 33.3%) or in the service industry (15 of 51 patients, 29.4%). For most patients, their family or friends were aware of the patient's breast cancer diagnosis (46 of 51 patients, 90.2%) and the plan for RT (45 of 51 patients, 88.2%) (Table 1).

Patient-reported outcomes of radiation dermatitis with Skindex-16 (traditional Chinese)

The traditional Chinese version of the Skindex-16 questionnaire demonstrated good overall internal consistency (Cronbach alpha = 0.87). Skindex-16 scores were collected at 3 time points: before RT started (at baseline),

in the middle of RT, and after RT was completed, with average (\pm SD) total scores of 14.2 ± 15.5 , 25.9 ± 20.2 , and 29.4 ± 20.0 , respectively. The Skindex-16 results showed that patient-reported discomfort gradually increased from the start of the treatment and was most severe at the first follow-up after treatment. The increasing trend was comparable in all 3 domains (symptoms, emotion, and function). For symptoms, the average (\pm SD) scores at baseline were 2.4 ± 3.5 , 7.0 ± 4.9 during RT, and 8.7 ± 5.6 after RT was completed. For emotion, the average (\pm SD) scores at baseline were 8.6 ± 9.1 , 12.9 ± 10.3 during RT, and 14.1 ± 9.6 after RT was completed. For function, the average (\pm SD) scores at baseline were 3.1 ± 4.8 , 6.0 ± 7.0 during RT, and 6.6 ± 6.7 after RT was completed. In all 3 domains, the scores showed a significant increase in the middle of RT compared with the scores before RT (baseline), followed by a stabilization in changes at the first outpatient follow-up (Fig. 2a). In this study cohort, one-third (n = 17, 33.3%) of the patients received conventional RT (6-week treatment course, 5000-6000 cGy in 25-30 fractions), and two-thirds (n = 34, 66.7%) underwent hypofractionated RT (5-week treatment course, 4256-5256 cGy in 16-21 fractions). The Skindex-16 scores did not differ significantly between the 2 groups (Fig. 2b).

Subgroup and association analyses

Regardless of the fractionation regimens, subgroup analysis demonstrated a high level of satisfaction with the video application. Around 90% in both groups (hypofractionated: 31, 91.2% vs conventional: 15, 88.2%; $P = .74$) reported a better understanding of radiation dermatitis. Both groups also reported gaining emotional support after watching the video (hypofractionated: 30, 88.2% vs conventional: 16, 94.1%; $P = .51$). The Cramer's V test showed no obvious association between patient characteristics and level of satisfaction. The level of emotional support, frequency of watching the video, and overall satisfaction level were not associated with the patient's age, educational status, occupation, or social support (Fig. 3).

Satisfactory survey and frequency of using the health education video

Results of the satisfactory survey showed that most patients were satisfied with the content of the video (46, 90.2%) and agreed that they had a better understanding of RT dermatitis after watching the video (46, 90.2%) (Fig. 4a). Most patients agreed that using the QR code link was convenient for them to access the video (49, 96.1%) and were willing to recommend the video to other patients (49, 96.1%).

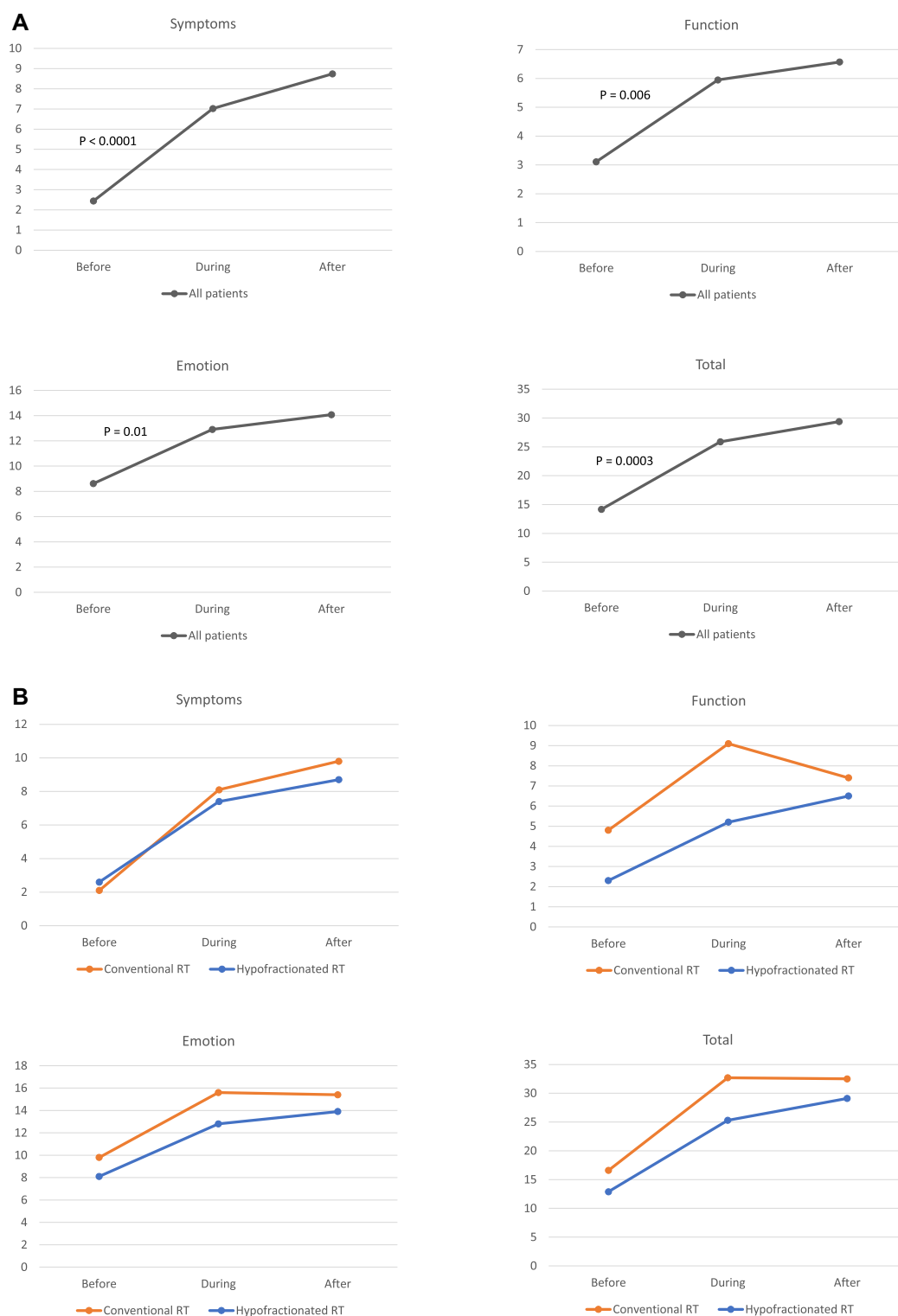


Figure 2 Patient-reported dermatitis scores: longitudinal data. This figure presents changes in Skindex-16 scores at 3 time points. (a) Total and subdomain scores of all 51 patients. Compared with baseline scores (before radiation therapy [RT]), statistically significant increases were observed in all 3 subdomain scores and the total score in the middle of the treatment course. No statistical differences were noted between the mid-RT and post-RT scores in any domain. (b) Subdomain and total scores between the conventional RT and hypofractionated RT groups were not statistically different at any of the 3 time points. Orange line: conventional RT. Blue line: hypofractionated RT.

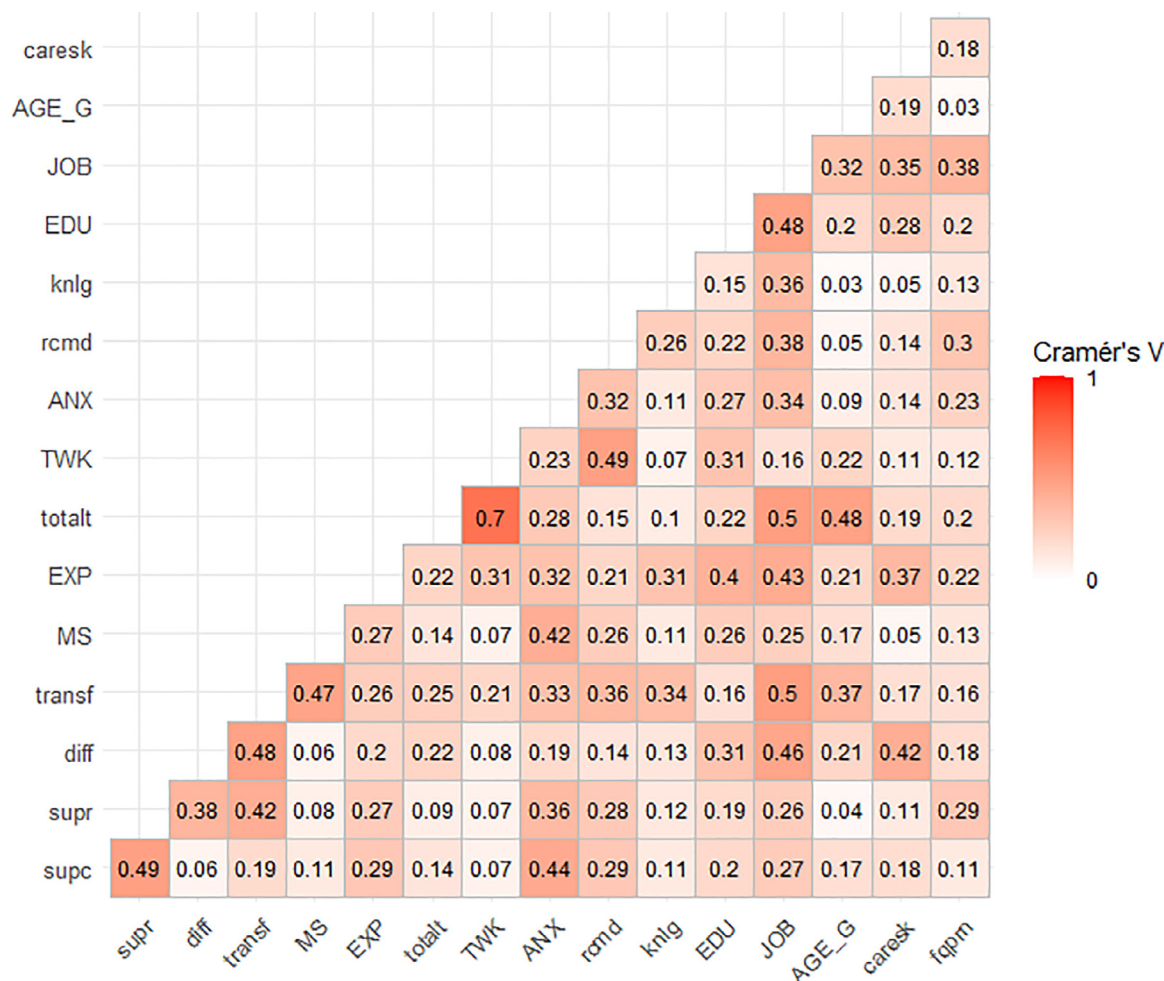


Figure 3 Association between patient characteristics and the effectiveness of educational video usage. Patient characteristics, including age, occupation, educational level, and social support, were included in the analysis. The level of understanding and frequency of applying the video was self-evaluated by all 51 patients using a satisfaction survey at their first clinic follow-up. There was no significant association between patient characteristics and the level of understanding of the video content, level of satisfaction, or frequency of watching the educational video.

Abbreviations: AGE_G = age group; ANX = effectiveness of the video in reducing anxiety; caresk = level of understanding of self-care skills for radiation therapy (RT) dermatitis; diff = difficulty in understanding the video contents; EDU = education; EXP = severity of skin reactions compared with patient's expectation before treatment; fqprn = more frequent video use when dermatitis worsened; JOB = occupation; knlg = improvement in knowledge of RT dermatitis; MS = emotional support; rcmd = willingness to recommend the video to other patients; supc = family and friends knowing cancer diagnosis; supr = family and friends knowing scheduled RT; totalt = self-estimated total number of video plays; transf = overall effectiveness of knowledge absorption from the video; TWK = self-estimated weekly number of video plays.

Regarding the frequency of replaying the video during the treatment course, most patients (43, 84.3%) recalled watching the video no more than 6 times, 6 patients (6, 11.8%) recalled 6 to 10 times, 1 patient reported 16 to 20 times, and 1 reported over 20 times. Results of the satisfactory survey showed that most patients were satisfied with the content of the video (46 of 51 patients, 90.2%) and agreed that they had a better understanding of RT dermatitis after watching the video (46 of 51 patients, 90.2%) (Fig. 4a). Most patients agreed that using the QR code link was convenient for them to access the video (49 of 51 patients, 96.1%) and were willing to recommend the video to other patients (49 of 51 patients, 96.1%).

Regarding the frequency of replaying the video during the treatment course, most patients (43 of 51 patients, 84.3%) recalled watching the video no more than 6 times, 6 patients (6 of 51 patients, 11.8%) recalled 6 to 10 times, 1 patient reported 16 to 20 times, and 1 reported over 20 times. The majority (42 of 51 patients, 82.4%) stated that the first 2 weeks during the RT course were the time when they watched the video most frequently (Fig. 4b). All patients except 1 found their skin reaction most severe starting from the third week of the RT course (at the third/fourth week: 22 of 51 patients, 43.1%; fifth/sixth week: 28 of 51 patients, 54.9%) (Fig. 4b), and one-fourth (13 of 51 patients, 25.5%) of the

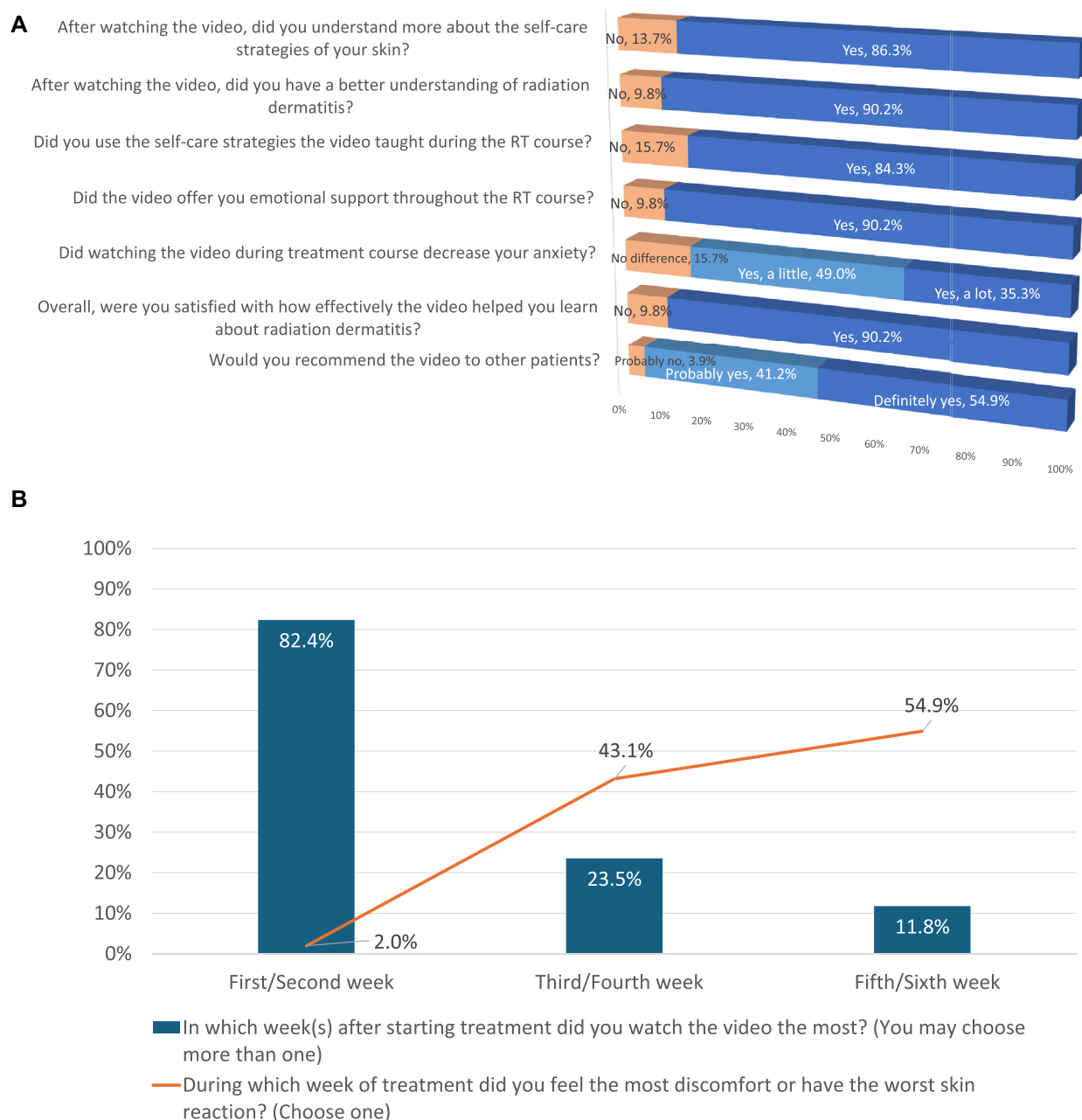


Figure 4 Patient-reported satisfactory outcomes and the usage rate of videos during the treatment period. (a) A total of 51 patients completed the multiple-choice questionnaire during their first follow-up clinic visit. The questions included patients' self-assessed understanding of the educational content of the video, their ability to apply the health education knowledge, their self-assessed level of anxiety reduction from watching the video, and their willingness to recommend the video to others. (b) The time periods when patients recalled watching the education video most frequently (blue bars) and when they recalled experiencing the highest levels of skin discomfort (orange line) during the treatment course.

Abbreviation: RT = radiation therapy.

patients stated that they frequently replayed the video after their skin reaction became prominent. Most patients felt that the educational video offered them emotional support (46 of 51 patients, 90.2%) and decreased their anxiety (43 of 51 patients, 84.3%) throughout the RT course (Fig. 4a).

Discussion

The educational intervention via a 4-minute video in this pilot study effectively enhanced our understanding and improved the process of patient education for

radiation dermatitis at the department. The video's content, which included the mechanism of RT, self-care for irradiated skin, precautionary activities, and toxicity grading, was met with approval by over 90% of the participants who reported understanding and implementing the self-care strategies. The utility of the video transcended patient demographics and RT fractionation schedules, suggesting a universally beneficial educational tool that may contribute to reduced psychosocial distress across diverse patient subsets.

In the context of our study's population comprising exclusively ethnic Chinese individuals, we initially expected to observe reluctance in patients' willingness to share their diagnosis and treatment with their social network, as cultural factors might cause patients to self-isolate compared with their Western counterparts.^{20,21} Nonetheless, the majority (around 90%) of participants were open to disclosing their diagnosis of cancer and RT treatment status to their family and friends – a trend reflecting the openness of Taiwanese society. Our study revealed that the provision of multimedia educational resources plays a unique role in emotional support, even for patients with robust social backing. This pilot study highlighted that such multimedia resources and social support from family and friends were complementary, not mutually exclusive, in contributing to the emotional well-being of breast cancer patients undergoing RT.

In the realm of patient education, the efficient delivery of information is crucial. In the Taiwanese context, familiarity with QR codes – gained through widespread use during the pandemic – facilitated the adoption of QR code-linked resources for patient use. Data from our study suggested a significant engagement with the educational content and the need to reengage the material after radiation dermatitis worsened, highlighting the potential of a QR code as a convenient means of accessing educational material. The recommendation of the educational video by 96.1% of patients to their counterparts further supported its efficacy, underscoring the need for additional research into multimedia as a standardized modality for patient education across various clinical settings.⁶

The observed lack of a significant relationship between patient characteristics and the outcomes of educational engagement – such as satisfaction and emotional support – reinforced the universality of the video as an educational medium. The fact that one-fourth of the patients replayed the video when RT dermatitis worsened suggested that, although most patients had the necessary information at initial exposure to educational material during the first consultation, some still needed reminders of self-care. This initial viewing, facilitated by tablets or televisions, paired with the option to revisit the content via QR codes, ensured that patients had at least 1 comprehensive educational interaction, with further access available as required throughout their treatment course. This also helped to slightly alleviate the manpower pressure on nursing staff in providing education.

Patient-reported outcomes regarding skin reactions with Skindex-16 revealed a consistent escalation in the severity of skin reactions, particularly after the third week of RT. Notably, Skindex-16 scores in the symptom domain continued to rise at the first post-RT clinical visit, suggesting a persistent need for patient education even after the completion of treatment. This trend signifies the potential benefits of tailored educational content that addresses late-stage skin changes, offering reassurance about likely recovery and thereby aiming to mitigate patient anxiety posttreatment.

To evaluate differences in skin reactions between patients receiving hypofractionated RT and conventional RT, we performed subgroup analyses and found no significant disparities in the severity of skin reactions across the symptoms, emotion, and function domains. Patients in both groups reported that the education video provided substantial emotional support and fostered a better understanding of radiation dermatitis. This outcome demonstrated the consistency of the education video in conveying necessary information and offering emotional support, regardless of the RT regimens.

This study contributes novel insights into video education for breast cancer patients undergoing RT, a subject that has been minimally explored in existing literature.¹³ The utilization of the Skindex-16 questionnaire at 3 pivotal points—before, during, and after RT—enhanced our understanding of patient-reported outcomes, delineating the connection between patient discomfort and video viewership. This approach also informed potential refinements in patient education strategies.

Despite the strengths of our approach, the study's limitations included its nonrandomized design and modest sample size. It may also have been subject to recall bias since the satisfaction questionnaire was administered within 4 weeks after the completion of treatment. Nonetheless, the integration of health education videos into the RT regimen represented a low-risk, cost-effective strategy that posed no detriment to patients while offering potential benefits, meriting further exploration. Future research could pivot toward assessing the impact of educational videos on various patient subgroups, tailoring content to meet diverse needs,¹⁴ and exploring the potential long-term effects of educational interventions on patient outcomes and prognosis.

Conclusions

This study provided insight into patients' habits regarding the use of multimedia educational materials. It showed that the use of these materials was not influenced by the patient's educational level, occupation, or social support. This study also found that patients continued to need health education for radiation dermatitis after treatment ended. Additionally, it offered a way to continually provide patients with skin care education. This study laid

a solid foundation for future research on breast cancer education and serves as a valuable reference.

Disclosures

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary materials

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