Original Research

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A comprehensive educational intervention to reduce depression, anxiety and complications in Greek patients with ostomy

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Abstract

Background and aims. The creation of an ostomy constitutes a profound surgical intervention, invariably introducing a multitude of potential difficulties and challenges into a patient's life. The aim of the study was to assess the effectiveness of a structured educational intervention, combined with nursing follow-up for self-care, in reducing anxiety, depression, and peristomal complications among patients who have undergone intestinal or urinary ostomy surgery, compared to those receiving standard care (control group).

Methods. A randomized, prospective comparative study was conducted from June 2023-April 2024, involving 100 adult patients with recently formed ostomies residing in the capital of Greece. Participants were randomly assigned to either an Intervention Group (IG) (n=48) or a Control Group (CG) (n=52). The IG received a structured, in-home educational intervention with printed materials and systematic nursing monitoring. Both groups had reinforcement sessions at 45 and 90 days. The study featured dual outcome assessments at baseline, 45 and 90 days. Peristomal complications were measured using the Ostomy Skin Tool (OST), while anxiety and depression were assessed with the Hospital Anxiety and Depression Scale (HADS). For the study purposes, a structured educational tool was developed in three versions, each adapted to the specific needs and characteristics of colostomy, ileostomy and urostomy.

Results. The analysis of HADS scores indicated a statistically significant difference in the IG versus the CG at both 45 days for anxiety ($p=0.002$) and depression ($p<0.0005$), and at 90 days for anxiety ($p=0.001$) and depression ($p<0.0005$). Furthermore, analysis of OST scores identified a statistically significant difference in the complication index at 90 days ($p<0.0005$) for the IG compared to the CG. Regarding the change in the severity index, a statistically significant difference was also recorded in the IG versus the CG at both 45 days ($p=0.001$) and 90 days ($p<0.0005$).

Conclusions. A structured, educational intervention significantly improves ostomy patients' psychological well-being (anxiety and depression) and reduces clinical complications. The practical success of this intervention is largely attributed to its accessible printed tool and dedicated nursing follow-up.

Keywords: peristomal complications, anxiety, depression, structured educational self-care tool

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Introduction

Ostomy surgery isn not a new discovery. As early as the 4th century BC, Praxagoras of Kos, faced a case of intestinal obstruction unresponsive to medication and performed a surgical incision in the abdominal area to remove feces, followed by immediate suturing of the incision. This approach is considered one of the first recorded surgical interventions for treating intestinal obstruction via an artificial stoma [1].

Living with a stoma is a bio-psycho-social landmark event that fundamentally alters an individual's bodily integrity, daily routines, and personal identity [2]. Consequently, ostomy patients often face significant psychological challenges, exhibiting high rates of anxiety (~47.60%) and depression (~38.86%) [3]. This adjustment process is often arduous, marked by a broad spectrum of psychological and emotional responses. Patients are commonly faced with an altered body image, which acts as a powerful depressive factor, leading to feelings of being "defective" or unattractive. The chronic demands of stoma care, coupled with daily life restrictions and future uncertainties, typically cultivate a persistent sense of hopelessness [4]. A primary source of distress is intense generalized anxiety, frequently centered on potential public incidents like appliance leakage or detachment, undesirable odor, or audible flatus. Furthermore, broader health concerns and apprehension regarding the progression of the underlying disease are prevalent [5]. These anxieties can manifest as "over-control" behaviors and significant social avoidance, hindering participation in social interactions, outings, employment, and educational settings [2,6,7].

Beyond the psychological dimension, stoma creation often leads to frequent and significant physical health complications, requiring continuous monitoring and care. Peristomal skin complications (PSCs) are a primary concern, occurring with a high frequency of up to 88% [8]. These complications are especially prevalent in ileostomies (25–43%) and urostomies (~50%) [9,10]. The most reported cause for these PSCs is chemical dermatitis resulting from leakage [11,12].

Metabolic disturbances are another major concern. In ileostomy patients, bypassing the absorptive function of the colon places individuals at risk for dehydration, hyponatremia, gallstone formation, and in severe cases, renal failure [13–15]. Resection of the terminal ileum can also impair vitamin B12 absorption; many patients require long-term, often lifelong, monitoring and supplementation, usually via intramuscular injections [16]. For urinary diversions constructed with intestinal segments, long-term metabolic consequences include hyperchloremic metabolic acidosis, increased risk of kidney stones, recurrent urinary tract infections, and additional vitamin B12 deficiency [17]. In contrast, colostomies are generally not associated with systemic metabolic disturbances, unless proximal intestinal disease is present [15].

The main purpose of this research was to investigate the effectiveness of a structured educational intervention, coupled with nursing follow-up for self-care, in anxiety levels, depressive symptoms, and the incidence of peristomal complications among patients who have undergone intestinal or urinary ostomy surgery, compared to a control group receiving usual care and standard practices.

Methods

Setting and sample

The study was conducted in Athens, the capital of Greece. Initially, 108 patients participated, but only 100 successfully completed the research. A total of 308 home visits were performed between June 2023 - April 2024. To be included, participants had to be at least 18 years old and have undergone intestinal or urinary ostomy surgery (colostomy, ileostomy, or urostomy) within 30 days prior to enrollment, while also demonstrating adequate communication ability essential for engaging with the educational intervention. Patients under 18, those with a fistula, drain, or nephrostomy or anyone whose ostomy surgery occurred more than 30 days before enrollment were not included in the study.

Participants recruitment and data collection

The recruitment and selection of potential participants were carried out using a database belonging to provider of ostomy bags on behalf of the Greek healthcare system. The initial approach was made by phone.

During this call, the main researcher provided information about the current study, clearly distinguishing between the provision of routine care and the invitation to participate in the research. If a patient verbally expressed interest, the first home visit (Day 0 - Baseline) was scheduled. During this visit, further clarifications were provided, and the patient thoroughly reviewed the information sheet. The participating patients, after meeting the inclusion criteria and providing their consent, were allocated randomly using a table of random numbers. The allocation was either to the IG (which received the structured educational intervention) or the CG (which received usual care). This method was used in combination with the dynamic allocation method, with the type of ostomy (ileostomy / urostomy / colostomy) as the stratification factor.

Immediately following written consent, the patient was formally enrolled, and the randomization process commenced, allocating the patient to either the intervention or control group. Dynamic allocation was employed for randomization, utilizing a predetermined list and incorporating stoma type (ileostomy, urostomy, or colostomy) as a stratification factor to ensure balanced group distribution across this critical clinical characteristic. Post-randomization, each patient received a unique identifier to maintain anonymity during data analysis.

For patients randomized to the IG, a structured educational intervention was implemented by the researcher following the Day 0 measurements. This intervention was based on a specially designed study tool described below.

Patients also received relevant printed educational materials. Subsequently, two follow-up home visits were scheduled: one at 45 days and one at 90 days post-enrollment. During each follow-up visit, all outcomes (anxiety, depression and complications) were re-evaluated, and a reinforcement session of reminder education was conducted using the educational tool, emphasizing areas of patient difficulty and addressing emerging questions.

Patients randomized to the CG received usual care following their Day 0 measurements. This encompassed the standard verbal and practical education on ostomy appliance application provided by the researcher, but without the use or provision of the study's structured educational tool. Similar to the intervention group, follow-up visits were scheduled at 45 and 90 days. During these visits, all outcomes (anxiety, depression, and complications) were assessed, but the structured reinforcement education was not administered. However, for ethical considerations, upon completion of the final 90-day assessment, CG patients received education based on the educational tool and were provided with the printed materials, ensuring their access to the potential benefits of the intervention after the comparative study period concluded.

Questionnaires

Socio-demographic and clinical data

Patient demographics included gender, age, height and weight for Body Mass Index (BMI) calculation, marital status, nationality, people living with the patient, employment status. Finally, data pertaining to social support were documented, such as the presence of a primary caregiver and the estimated daily time devoted to stoma care. Clinical data of the disease and its treatment, diagnosis, the type of newly formed stoma (ileostomy, colostomy or urostomy) and its estimated duration (temporary or permanent), cardiovascular disease, and diabetes were collected.

Hospital Anxiety and Depression Scale (HADS)

The Hospital Anxiety and Depression Scale (HADS) was used to evaluate anxiety and depression. It consists of 14 items, with two independent seven-item subscales: one for anxiety and one for depression. Responses are measured on a four-point Likert scale (0 to 3). Scores for each subscale range from 0 to 21, with specific cutoff points indicating the absence (0-7), possible presence (8-10), or definitive presence (≥11) of clinically significant anxiety or depressive symptoms. The Greek version of the HADS was culturally adapted and validated for the Greek population demonstrating high internal consistency [18].

Ostomy Skin Tool (OST)

The specialized Ostomy Skin Tool (OST) was utilized for the objective assessment of peristomal skin integrity in the present study. The tool underwent a rigorous translation process. Initially, two independent researchers performed forward translations from English to Greek, which were then reconciled into a single consensus version. Subsequently, a back-translation into English was performed by two independent researchers, and the definitive Greek version was reviewed and finalized by a translator.

As a validated instrument, the OST is designed for the standardized evaluation and longitudinal monitoring of peristomal skin condition. The tool incorporates three dichotomous (Yes/No) questions on the presence of hemorrhage, ulceration/wounds, and erosion/exudate. It also includes three questions assessing the intensity of pruritus, pain, and burning on a 0-10 numerical rating scale, where '0' signifies complete absence and '10' represents the most severe manifestation. An objective assessment of skin discoloration is also integrated. Based on the aggregate responses, a Decision Tree (DT) algorithm provides a standardized and quantifiable measure of dermal complication severity, categorizing the peristomal skin into four distinct levels (DT0: No treatment required, DT1: Mild, DT2: Moderate, DT3: Severe) [19].

Educational Self-Care Intervention Tool

The educational intervention was designed as a structured, systematic, and individualized program for Greek patients with newly formed ostomies, utilizing a specialized educational tool that was complemented by targeted nursing follow-up and self-care support. The content of the tool was developed in three distinct yet parallel versions, adapted specifically for colostomy, ileostomy, and urostomy, with the goal of providing comprehensive information and practical guidance.

Each version included clear information in an understandable language, enriched with photographic material, covering critical topics such as an introduction to the function of the specific stoma type, frequently asked questions about surgery and recovery, instructions for selecting appropriate care materials, and a step-by-step description of the technique for changing the collection system. The tool also provided information for recognizing and initially managing problems or complications. Specifically, each document included ten questions on key aspects of stoma care, ten practical tips for the prevention of peristomal dermatitis and leaks, ten questions and answers on diet for patients with colostomy and ileostomy, and ten more general tips for daily life. The aim was to facilitate the patient's adaptation to daily activities and improve their overall autonomy.

Ethical considerations

Confidentiality of information and anonymity of participants was respected. Participation in the study was voluntary, and an informed consent form was requested from each participant. Permissions were obtained from all relevant institutions. To further fortify participant rights and foster transparency, each individual enrolled in the study was provided with a separate complaint form concurrently with the consent documentation.

Statistical analysis

Data were expressed as mean±Standard Deviation (mean±SD) or mean±Standard Error (mean±SE) (ANCOVA

model) and the Kolmogorov-Smirnov test examined the normal distribution of the parameters. We used the two-way Mixed ANOVA model using as factors 'the intervention' (between group) and 'time' (within group) for the analysis of quantitative variables using the Bonferroni correction for all pairwise comparisons either between or within groups. The comparison of the complications between groups were performed using the Chi-square test. Baseline-balance analysis between groups, was performed with the ANCOVA model using the absolute change from baseline after 45 and 90 days as dependent variable, the intervention (Control-Guidelines) as factor and the baseline value of each variable as covariate. All tests are two-sided, statistical significance was set at $p < 0.05$. All analyses were carried out using the statistical package SPSS vr 21.00 (IBM Corporation, Somers, NY, USA).

Results

The study included 100 adult patients who had undergone surgery for the creation of a colostomy, ileostomy, or urostomy within the last 30 days. After providing written informed consent, participants were randomly assigned to two groups. The CG included (n=52) patients (24 men, 28 women) with a mean age of 61.02±13.48 years, while the IG included (n=48) patients (31 men, 17 women) with a mean age of 61.69±15.89 years. Regarding ostomy types, in the control group, 27 had an ileostomy, 14 a colostomy, and 11 a urostomy within the last 30 days, while in the intervention group, 28 had an ileostomy, 10 a colostomy, and 10 a urostomy. The two groups did not differ in all the basic characteristics examined, with $p>0.05$ for all parameters. Their demographic and clinical data are presented in table I.

Anxiety

There was no statistically significant difference at baseline (p=0.189) between groups while at 45 days (p=0.001) and 90 days (p<0.0005) the IG presented lower HADS values compared to the CG. The HADS anxiety subscale was statistically significantly lower at 45 days (p=0.023), and 90 days (p=0.006) compared to baseline, while there was no difference between 45 and 90 days (p=1.000) for the intervention group. There was no difference across all time points for the CG (p>0.05). The IG showed a statistically significant decrease in the absolute change of the HADS anxiety subscale from baseline at both 45 days (p=0.002) and 90 days (p=0.001) respectively, adjusted for the baseline value, compared to the CG (Table II).

Depression

There was no statistically significant difference at baseline (p=0.563) between groups while at 45 days (p<0.0005) and 90 days (p<0.0005) the IG presented lower HADS values compared to the CG. The HADS depression subscale was statistically significantly lower at 45 days (p=0.001), and 90 days (p<0.0005) compared to baseline, while there was no difference between 45 and 90 days (p=0.238) for the intervention group.

There was no difference across all time points for the CG (p>0.05). The IG showed a statistically significant decrease in the absolute change of the HADS depression subscale from baseline at both 45 days (p<0.0005) and 90 days (p<0.0005), respectively, adjusted for the baseline value, compared to the CG (Table III).

Table I. Demographic and clinical characteristics of participants.

	Control Group	Intervention Group	p-value
Gender Male/Female	24(46.2%) / 28(53.8)	31(64.6%) / 17(35.4%)	0.073
Age	61.02±13.48	61.69±15.89	0.821
Height	168.56±9.29	170.96±11.17	0.244
Weight	70.80±17.14	74.31±19.56	0.341
BMI	24.85±5.32	25.31±5.85	0.685
Marital status Single / married/divorced	9(17.3%) / 33(63.5%) / 10(19.3%)	7(14.6%) / 30(62.5%) / 11(23.0%)	0.960
Nationality Greek / Other	48(92.3%) / 4(7.7%)	43(89.6%) / 5(10.4%)	0.734
People living with the patient	2.40±1.10	2.70±1.09	0.170
Work Employed / Unemployed/ Retired	19(36.5%) / 6(11.5%) / 27(51.9%)	20(41.7%) / 7(14.6%) / 21(43.8%)	0.707
Type of stoma ileostomy / colostomy/ urostomy	27(51.9%) / 14(26.9%) / 11(21.2%)	28(58.3%) / 10(20.8%) / 10(20.8%)	0.751
Duration of stoma temporary / permanent	18(34.6%) / 34(65.4%)	17(35.4%) / 31(64.6%)	1.000
Chemotherapy no / yes	36(69.2%) / 16(30.8%)	35(72.9%) / 13(27.1%)	0.826
Radiotherapy no / yes	45(86.5%) / 7(13.5%)	37(77.1%) / 11(22.9%)	0.300
Cardiovascular disease no / yes	40(76.9%) / 12(23.1%)	36(75.0%) / 12(25.0%)	1.000
Diabetes no / yes	45(86.5%) / 7(13.5%)	39(81.3%) / 9(18.8%)	0.588
Caregiver no / yes	13(25.0%) / 39(75.0%)	8(16.7%) / 40(83.3%)	0.336
Daycare time less than ½ hour/more than ½ hour	17(32.7%) / 35(67.3%)	15(31.3%) / 33(68.8%)	1.000

Complications' severity

Regarding the severity of the ostomy complications, there was no statistically significant difference at baseline (p=0.195) between groups in the distribution of severity categories. However, at 45 days (p=0.001) and 90 days (p<0.0005) a statistically significant difference emerged, signaling a clear divergence in severity profiles attributable to the intervention (Table IV).

Quantitative complications

There was no statistically significant difference at baseline (p=0.513) and 45 days (p=0.089) between groups, while a significant difference was noted at 90 days (p<0.0005), with the showing lower complication score. The "complications" subscale was statistically significantly lower at 90 days (p=0.022) compared to baseline for the IG, while there was no difference between baseline and 45 days (p=0.217), nor between 45 and 90 days (p=0.519) for the IG. There was no difference across all time points for the CG (p>0.05). There was no statistically significant difference in the absolute change of the "Complications" subscale from baseline at 45 days (p=0.117), adjusted for baseline, between the groups. The IG showed a statistically significant decrease in the absolute change of the "Complications" subscale from baseline at 90 days (p<0.0005), adjusted for the baseline value, compared to the CG (Table V).

Table II. Comparison of HADS anxiety between control and intervention groups during the observation period.

Groups	Time			Absolute change	
	Baseline	45 days	90 days	Baseline-45 days	Baseline-90 days
	Mean ±SD	Mean ±SD	Mean ±SD	Adjusted Mean ±SE	Adjusted Mean ±SE
Control	6.83±4.15	6.65±3.71	6.75±4.05	0.13±0.44	0.21±0.53
Intervention	5.77±3.80	4.2±3.31*	3.75±4.20*	-1.87±0.46	-2.33±0.55
p-value	p=0.189	**p=0.001**	**p<0.0005**	**p=0.002**	**p=0.001**

SD: Standard Deviation SE: Standard Error, Adjusted Mean (ANCOVA), *p<0.05 vs baseline

Table III. Comparison of HADS depression between control and intervention groups during the observation period.

Groups	Time			Absolute change	
	Baseline	45 days	90 days	Baseline-45 days	Baseline-90 days
	Mean ±SD	Mean ±SD	Mean ±SD	Adjusted Mean ± SE	Adjusted Mean ± SE
Control	7.27±4.75	7.08±4.16	6.60±4.66	-0.04±0.45	-0.47±0.57
Intervention	6.67±5.63	4.23±3.92*	3.29±4.02*	-2.60±0.47	-3.60±0.59
p-value	p=0.563	**p=0.001**	**p<0.0005**	**p<0.0005**	**p<0.0005**

SD: Standard Deviation SE: Standard Error, Adjusted Mean (ANCOVA), * p<0.0005 vs baseline

Table IV. Complication assessment between control and intervention groups.

Groups	Time		
	Baseline	45 days	90 days
	No need-Mild/Moderate/Severe	No need-Mild/Moderate/Severe	No need-Mild/Moderate/Severe
Control	12(23.1%) / 9(17.3%) / 31 (59.6%)	13(25.0%) / 13(25.0%) / 26(50.0%)	13(25.0%) / 14(26.9%) / 25(48.1%)
Intervention	12(25.0%) / 15(31.3%) / 21(43.8%)	24(50.0%) / 17(35.4%) / 7(14.6%)	32(66.7%) / 11(22.9%) / 5(10.4%)
p-value	p=0.195	p=0.001	p<0.0005

Table V. Comparison of quantitative complications between control and intervention groups during the observation period.

Groups	Time			Absolute change	
	Baseline	45 days	90 days	Baseline-45 days	Baseline-90 days
	Mean ± SD	Mean ± SD	Mean ± SD	Adjusted Mean ± SE	Adjusted Mean ± SE
Control	3.69±3.03	3.38±3.08	3.98±2.96	-0.18±0.36	0.4±0.37
Intervention	3.31±2.73	2.46±2.20	1.88±2.40*	-1.00±0.37	-1.61±0.39
p-value	p=0.513	p=0.089	**p<0.0005**	p=0.117	**p<0.0005**

SD: Standard Deviation SE: Standard Error, Adjusted Mean (ANCOVA), *p<0.05 vs baseline

Discussion

Impact on anxiety and depression

The results revealed that the structured educational intervention significantly improved ostomy patients' anxiety and depression levels at both 45 and 90 days. These findings are consistent with those of Khalilzadeh et al. (2019), who similarly demonstrated that structured ostomy care education reduced anxiety and enhanced quality of life when evaluated at baseline and two months post-intervention [20]. The research by Ang et al. further underscores the crucial role of nursing education and support in mitigating psychological stressors for ostomy patients [5]. While Harris et al. focused on stoma site marking, their work supports the broader concept of holistic care and education in improving patient anxiety and reducing complications [21]. Osborne (2022) provides additional support, showing that reduction of complications such as leaks indirectly contributes to improved psychological outcomes [22].

The observed anxiety reduction is attributable to several interconnected mechanisms. Structured education, by providing clear instructions and practical training in ostomy care (e.g., appliance changes, skin care, content management), likely increased patient knowledge and understanding. This systematic information and skill acquisition reduced the fear of the unknown, directly resulting from demystifying the process and familiarizing patients with their equipment [20].

Furthermore, the emphasis on practical skill acquisition through demonstration and guided practice boosted patients' self-efficacy—their belief in their ability to successfully manage their ostomy [23]. The observed reduction in anxiety and depression is likely attributable to several interconnected mechanisms. Structured education, by providing clear instructions and practical training in ostomy care, probably increased patient knowledge and understanding, which in turn may have reduced fear of the unknown. Furthermore, emphasis on hands-on skills and guided practice appears to have enhanced patients' self-efficacy**,** a mechanism that has been closely linked to psychological adaptation and better health outcomes [24,25]. Greater self-efficacy in ostomy self-care correlates with higher confidence, less stigma, and improved quality of life [26,27].

The significant reduction in depressive symptoms in the intervention group is also explicable through interconnected mechanisms. The alleviation of anxiety itself positively impacts mood. More critically, mastering self-care skills via the intervention empowered patients, fostering a renewed sense of control over their bodies and functions. This counteracts feelings of loss and helplessness often associated with such surgery [2,28]. Improved ostomy management, resulting in fewer practical difficulties, likely facilitated adaptation to an altered body image and reduced social isolation, both significant contributors to depression. Regular nursing support further protects against depression by mitigating feelings of loneliness [6,29,30].

Impact on peristomal complications

The data also show that the structured educational intervention significantly reduced peristomal complications at 90 days compared to the control group. At the outset of the study, the control group (CG) exhibited a 76.9% rate of moderate/severe peristomal complications, while the intervention group (IG) showed a similar rate of 75.1%. This observation aligns with existing research indicating that the incidence of early peristomal complications varies widely, with a significant proportion of patients experiencing at least one complication within the first days or months post-ostomy creation, reaching up to 85% within the first year [31,32].

The study's educational tool significantly improved the patients' ability to identify early dermatological issues and correctly use accessory products, a fundamental aspect of specialized ostomy care as highlighted by Colwell et al. [12]. Evidence from previous studies demonstrates that such structured education can significantly reduce the incidence of peristomal skin complications, as reported by Stokes et al. and Mansour & Alenezi [33,34].

The delayed statistical significance observed at 90 versus 45 days suggests that the benefits of improved technique and knowledge are cumulative, with initial effects potentially masked by immediate postoperative factors such as stoma changes or edema [35,36]. The reduction in peristomal complications offers indirect positive consequences, contributing to a sense of security and self-confidence, and reducing care costs [35,36].

These findings underscore the importance of specialized education in preventing physical complications, a field in which the role of stoma nurses is internationally recognized [37]. The time lag also implies that while early education is crucial [30], the clinical and statistical impact on complication prevention becomes evident only after a period of consistent application of learned practices, emphasizing the importance of ongoing support and skill reinforcement.

Limitations

This study has several limitations. First, the sample was drawn exclusively from patients in the Athens metropolitan area (Attica region), which restricts the generalizability of the findings to the wider Greek stoma population, particularly those living in rural or remote areas who may face distinct challenges, such as limited access to specialized healthcare facilities and dedicated stoma care nursing. Although the sample size (N = 100) was relatively robust, it may not have been sufficient to capture all clinically meaningful differences. An additional methodological constraint was the inability to blind either participants or researchers, introducing the risk of performance and detection bias despite the use of validated questionnaires. The 90-day follow-up period also limited the ability to assess long-term psychosocial adjustment, changes in

quality of life, and the development of late complications. Finally, the reliance on self-reported questionnaires for psychological and quality of life outcomes introduces subjectivity and the potential for social desirability bias.

Conclusions

This study demonstrates that a structured educational intervention can simultaneously enhance psychological well-being—by reducing anxiety and depression—improve multiple dimensions of quality of life and decrease the incidence of clinical complications within the Greek context. The development of an accessible printed educational tool, combined with systematic nursing follow-up, adds important practical value and supports its applicability in routine clinical practice. Variability in findings compared with individual studies likely reflects differences in intervention design, patient characteristics, and healthcare systems, highlighting the need for tailored, culturally sensitive approaches to ostomy care. Future research should include larger, multicenter studies with longer follow-up periods to evaluate the sustained impact of structured educational interventions on psychosocial and clinical outcomes. Additionally, exploring the integration of digital tools and peer-support models could further strengthen patient self-efficacy and adaptation in diverse healthcare settings.

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