

# Effectiveness of online-based education for self-care in ostomates: systematic review

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## 장루보유자의 자가간호를 위한 온라인 기반 교육의 효과: 체계적 문헌고찰

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**Abstract** With an increase in the number of individuals with ostomies globally, online-based programs are being used to educate ostomates. Therefore, this study analyzed the effects, characteristics, outcomes, and implications of online self-care education programs for ostomates. This systematic review searched the MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Cochrane Central Register of Controlled Trials (Central) electronic databases to conduct a meta-analysis of randomized controlled trials published up to December 2023. Two investigators independently extracted data and assessed study quality based on the risk of bias. Of the 519 identified studies, eight were relevant, which were divided by intervention: three studies used telehealth, three used mobile applications, and two, multimedia learning training. The educational programs in the relevant studies focused on ostomy knowledge, self-care, and prevention of complications; while some included psychological support. Online-based education programs can improve ostomy patients' adjustment and self-efficacy, reduce complications, and improve quality of life. Online-based education programs have easier accessibility by patients and nurses; it can effectively improve ostomy patients' quality of life and prevent future complications.

**Key Words** : Ostomates, Online-based education, Self-care, Randomized controlled trial, Systematic review, Intervention program

**요약** 본 연구의 목적은 장루보유자를 위한 온라인 기반 자가관리 교육 프로그램의 효과, 특성, 결과 및 시사점을 분석하는 것이다. 2023년 12월까지 발표된 무작위대조임상시험의 문헌고찰을 수행하기 위해 MEDLINE, CINAHL, Cochrane (Central) 전자데이터베이스를 검색하여 체계적 고찰을 수행하였다. 두 명의 연구자가 독립적으로 데이터를 추출하고 편향성 위험에 따라 연구의 질을 평가하였다. 확인된 519개의 논문 중 8개의 논문을 최종 분석하였으며, 중재방법에 따라 3편의 논문은 원격의료, 3편은 모바일 애플리케이션, 2편은 멀티미디어 학습교육으로 구분되었다. 중재교육 프로그램은 장루지식, 자가관리, 장루 합병증 예방, 심리적지지 등의 내용이 있었다. 장루보유자의 온라인 기반 교육 프로그램은 장루적응과 자기효능감 향상과 합병증 예방, 삶의 질을 개선함을 확인하였다.

**키워드** : 장루보유자, 온라인교육 프로그램, 자가간호, 무작위 실험연구, 체계적 문헌고찰, 중재연구

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## 1. Introduction

An ostomy is a surgically created temporary or permanent opening in the abdominal wall for the external discharge of bodily waste owing to conditions such as colon or small intestine diseases that hinder anal excretion[1]. Living with an ostomy entail navigating a myriad of physical and emotional challenges that demand heightened attention. Ostomates are required to acclimate to daily life, with self-care being paramount to sustaining a healthy and fulfilling lifestyle.

The prevalence of individuals with permanent, irreversible ostomies has increased, with figures escalating from 14,309 in 2017 to 17,117 in 2023[2]. Colorectal cancer is a significant contributor to ostomy surgeries and was the second most common cancer in Korea in 2024, accounting for 11.8% of cancer cases[3]. Rectal cancer, particularly when located near the anus, often requires a permanent ostomy following anal resection. Additionally, ostomies may be required in patients with rectovaginal fistula caused by radiation therapy gynecological cancers, as well as inflammatory bowel diseases[4,5]. Regarding bladder cancer, a urostomy may be performed through urinary diversion surgery[6]. The 40–59 age group is most affected by ostomy disabilities (41.9%)[2]. Regarding post-ostomy surgery, patients may experience difficulties mastering unfamiliar self-care routines and managing ostomy-related apparatus, which can result in physical, psychological, and social discomforts, emphasizing the importance of quick adjustment. There is a pressing need for long-term ostomy management education and repeated training. However, owing to the advent of Clinical Pathways (CP), patients often receive inadequate self-care education during their brief hospital stays and are discharged without being adequately adjusted[7]. This can lead to complications such as chemical damage and skin infections associated with fecal leakage[8]. Inadequate management of ostomy-related complications can

lead to the wastage of ostomy products, readmission, economic losses, and further physical and psychological difficulties[9]. Therefore, continuous education and preventive measures for post-discharge complications are crucial for ostomates.

Self-care education for ostomates should encompass stoma management and maintenance, including changing the stoma bag, emptying the pouch, daily life activities (hobbies, travel, work), sex life, and emotional support. Such education enables ostomates to practice proper hygiene, prevent complications, and enhance their quality of life[10]. Online education has emerged as an effective and convenient approach for the self-care education of ostomates. It allows people living with this condition to easily access information from the comfort of their homes and learn at a pace that suits them, thus accommodating their individual needs with significant flexibility. Online platforms offer a wealth of educational materials, videos, and resources that are consistently available[11], enabling users to access information and resolve issues or seek guidance at any time. Given that this approach offers a variety of content to cater to different needs, it is particularly effective for individuals with diverse learning styles and preferences[12].

With the increase in ostomy surgeries, interest in the effectiveness of online self-care education programs for ostomates has also increased. Previous studies on ostomates have explored various aspects, including the development of self-care education programs[13,14] and foundational studies for providing self-care interventions[15]. However, few studies have examined the content and overall effectiveness of these online education programs. Consequently, this study aimed to conduct a systematic review to identify the specific characteristics of online education programs for ostomates and evaluate their effectiveness. The findings may serve as foundational data for developing effective mobile app-based education programs tailored to the needs of ostomates.

## 2. Material and Method

### 2.1 Study design

This systematic review aimed to examine the characteristics and effectiveness of online-based education for self-care programs in ostomates.

The inclusion criteria were defined based on the PICO-SD framework (Participants, Intervention, Comparison, Outcome, Study Design) proposed in the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) 2020 statement[16]. This review only included studies that considered ostomates and examined online self-care intervention programs, including digital technology, mobile applications, telemedicine, multimedia, video, and online. Additionally, only studies that compared online education with in-person education (including booklets) were included; one-group studies without a control group were excluded.

All quantitative outcomes measured after the intervention program had been provided to the participants were included, regardless of the significance of the effects. This study selected randomized controlled trials that measured study parameters before and after the intervention. Degree dissertations, review articles, poster presentations, unpublished grey literature, and articles published in languages other than English were excluded.

### 2.2 Literature Search and Selection

The literature search was conducted between November 27, 2023, and December 7, 2023, on MEDLINE (PubMed), Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Cochrane Central Register of Controlled Trials (Central).

A preliminary search was conducted on November 27, 2023, in the PubMed database to establish a search strategy using the search terms “(Ostomy, Enterostomy) AND (Mobile Applications, Multimedia, Digital Technology) AND (Self Care, Self-Management, Self-Efficacy).” The key study questions were identified, and the search terms were selected based

on the 100 articles retrieved from the preliminary search. The final search formula was determined considering the advanced search features provided by each database. Strategies were designed to include Medical Subject Headings (MeSH). Additionally, combinations of search terms related to ostomates (surgical stomas, colostomy, ileostomy, jejunostomy, enterostomy, ostomy, stoma, ostomate) and online interventions (digital technology, mobile applications, telemedicine, multimedia, video, online) were used.

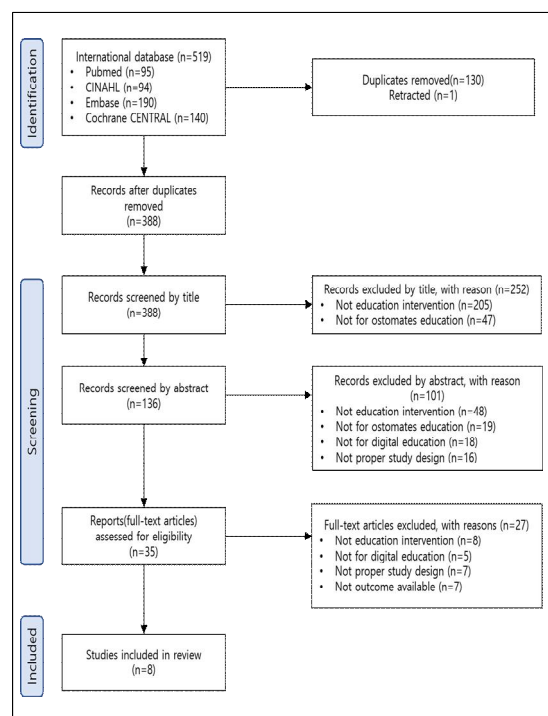


Fig. 1. Study Screening flow diagram

This study followed the PRISMA guidelines for systematic literature reviews[16]. EndNote X20 and Microsoft Excel 2020 were used to organize the retrieved literature. Of the 519 identified studies, 130 duplicates and one retracted article were excluded, leaving 388 articles for title and abstract screening. After excluding 353 articles that did not meet the selection criteria, the full texts of 35 articles were reviewed. Finally, eight articles were selected for the systematic review (Appendix 1). To eliminate irrelevant

studies, two researchers independently screened the titles and abstracts and then conducted a full-text review of the relevant studies. Figure 1 illustrates the flowchart of the literature selection process.

Regarding quality assessment, the Cochrane Risk of Bias 2.0 tool (RoB 2) was used[17]. Two researchers independently conducted the assessment, and disagreements were resolved through discussion to reach a consensus.

### 2.3 Data Analysis

The eight included studies were documented on a Microsoft Excel 2020 spreadsheet to analyze the characteristics and factors related to the interventions and intervention outcomes of the studies. The general characteristics (first author, year of publication, country, participant characteristics), intervention characteristics (method of intervention, duration, frequency, content), and intervention outcomes (instruments, outcome measures, effectiveness) were recorded.

## 3. Result

### 3.1 General Characteristics of the Included Studies

Table 1 presents the general characteristics of the literature selected for the final analysis. A total of eight studies on online intervention education for ostomates were selected. All eight studies were randomized controlled trials (RCTs) including a patient group that received online education and a control group. The total number of participants in the included studies was 1,040, with the sample size of the experimental group ranging from 35 to 101 and control group ranging from 32 to 103. The publication years ranged from May 2018 to October 2023, with seven studies published after 2020. Regarding countries, most included studies were from China (n=4, 50%)[A1,A2,A4,A5], followed by the United States (n=2, 25%)[A7, A8], Iran (n=1, 12.5%) [A3], and Taiwan (n=1, 12.5%)[A6]. The mean age of the participants ranged from 45.99 to 64.29 years, with three studies (37.5%)[A3,A5,A6] not reporting the mean age but providing the age range, indicating participation from various age groups. All

**Table 1. Characteristics of selected studies**

(N = 8)

Authors (Year)	Reference No	Country	Participants			
			n (Exp/Cont)	Age (M±SD)	Sex	Description of participant
Wang et al. (2018)	[A1]	China	100/103	58.07±14.51	129 males 74 females	156 Colostomy 35 Ileostomy 12 Urostomy
Huang et al. (2021)	[A2]	China	62/57	45.99±17.57	68 males 51 females	119 Colostomy
Heidari-Beni et al. (2022)	[A3]	Iran	42/43	NA	47 males 38 females	63 Colostomy 22 Ileostomy
Tan et al. (2022)	[A4]	China	35/32	58.00±4.32	61 males 6 females	67 Urostomy
Hao et al. (2023)	[A5]	China	50/50	NA	61 males 39 females	11 Ileostomy 39 Colostomy
Ko et al. (2023)	[A6]	Taiwan	54/54	NA	68 males 40 females	40 Ileostomy 68 Colostomy
Krouse et al. (2023)	[A7]	USA	90/101	64.29±12.26	88 males 103 females	80 Colostomy 63 Urostomy 4 More than one ostomy 3 Unknown
Rock et al. (2023)	[A8]	USA	78/89	64.2	90 males 77 females	N/A

Exp. = experimental group; Cont. = control group; NA = not applicable

articles reported the participants' sex, with more males (n=612) than females (n=428) enrolled. The most common type of ostomy was colostomy (n=525), followed by ileostomy (n=108) and urostomy (n=165), with one study[A8] not specifying the type.

### 3.2 Characteristics of Intervention Program

Table 2 presents the characteristics of the interventions used in the included studies according to the method of intervention, duration, frequency, and content. The education provided to the control groups was face-to-face education (including booklets). Three types of media were used for online education: multimedia learning using CDs, telehealth using websites, and mobile applications. Specifically, three studies (37.5%)[A2,A7,A8] used telehealth through

websites, two studies (25%)[A3,A6] used multimedia learning, and three studies (37.5%)[A1, A4, A5] used a combination of mobile applications and WeChat (online chat or video calls). The intervention duration ranged from five weeks to 22 months, and the frequency ranged from three to seven times, with program design varying across studies.

The educational content commonly included ostomy self-care, selection and use of ostomy-related materials, ostomy bag replacement, knowledge related to ostomy, prevention of complications, guidance for daily life, exercise guidance, and colostomy irrigation techniques.

In the two studies[A3, A6] that used multimedia learning as an educational method, patients and medical staff could not communicate personally

**Table 2. Intervention characteristics of selected studies**

Study	Reference No	Education program		
		Teaching method	Duration/ session	Contents
Wang et al. (2018)	[A1]	Mobile application	6 months/ 3 sessions	1. Appointment: The app users completed the basic personal and medical information and made an appointment with the enterostomal therapy (ET) nurse. 2. Photograph diagnosis: The ET nurses made a diagnosis based on the patients' uploaded stoma photographs. 3. Consultation: Patients could contact their ET nurses for help and support.
Huang et al. (2021)	[A2]	Telehealth	6 months/ 4 sessions	1. Individualized care programs: self-management, ostomy knowledge, complication prevention. 2. The implementation: individualized medical nursing programs. 3. Establishment of instant messaging groups such as WeChat and QQ groups: WeChat and QQ groups were set up for patients and their family members to publish their daily self-care diaries. 4. Establishment of public account.
Heidari-Beni et al. (2022)	[A3]	Multimedia learning education	3 months/ continuous	At discharge, the multimedia educational CD was given to watch and share with family. Once during post-hospital discharge, week two, and every two weeks until three months after discharge.
Tan et al. (2022)	[A4]	Mobile application, WeChat	22 months/ continuous	Individualized discharge nursing guidance based on the doctor's diagnosis and treatment plan, video lessons using the app, and video calls. WeChat feature (nurses answered patient questions).
Hao et al. (2023)	[A5]	Mobile application, WeChat	3 months/ 3 sessions	1. Encouraged patients to post daily self-care methods and photographs or videos, monitoring the patient's psychological and emotional state through telehealth, and step-by-step care for recovery. 2. Video lectures every month. 3. Aimed to help alleviate patients' nervousness and anxiety, build self-confidence, and help them return to their family and social lives.
Ko et al. (2023)	[A6]	Multimedia learning education	3 months/ 2 sessions	1. Information regarding the ostomy preparation process, including the selection of stoma-related materials and use. 2. Focused on cleaning techniques, manual bag replacement steps, and precautions.
Krouse et al. (2023)	[A7]	Telehealth	5 weeks/ 3 sessions	1. Focused on ostomy equipment, self-management, and self-care. 2. Focused on psychosocial issues. 3. Aimed to help participants with daily living.
Rock et al. (2023)	[A8]	Telehealth	6 months/ 5 sessions	Five telehealth sessions: Discussed topics such as ostomy appliances and accessories, nutritional guidance, and psychosocial support.

through the program; however, all information, from simple to complex concepts, was conveyed through audio and video materials. The three studies[A2, A7, A8] that used telehealth and the two studies[A5, A7] that used mobile applications provided individualized programs in addition to the ostomy education, which included psychological monitoring and facilitation of information sharing with other patients. Additionally, one study[A1] that used a mobile application provided personalized content, where patients could submit a picture of their ostomy,

receive consultation, and engage in self-care based on the instructions. Table 2 presents the details of the contents of each session.

### 3.3 Intervention Effectiveness

The instruments used to evaluate the effectiveness of the interventions in the included studies can be categorized into three broad groups: first, adjustment to ostomy and self-efficacy were assessed; second, anxiety, depression, and other emotional aspects were assessed; and third, participants' overall quality

**Table 3. Intervention characteristics of selected studies**

Authors (Year)	Measurements	Outcome variables	Result		
			Exp. M±SD(IQR) or n	Cont. M±SD or n	p
Wang et al. (2018)	OAI-23	Adaptation	70.80±4.64	54.54±10.48	< .001
	SSES	Self-efficacy	92.10±7.78	75.50±13.38	< .001
	Stoma complications	Complications	23	29	NR
Huang et al. (2021)	GSES	Self-efficacy	117.28±17.84	139.72±21.73	< .001
	ESCAa	Adaptation	23.18±2.03	21.06±1.91	< .001
	SF-36	QoL	56.37±3.79	50.23±4.28	< .001
	SAS	Anxiety	49.83±5.44	54.38±6.12	< .001
	SDS	Depression	47.96±4.79	52.07±4.26	< .001
	Stoma complications	Complications	3	9	.048
Heidari-Beni et al. (2022)	OAI-23	Adaptation	54.72±6.65	48.75±4.06	< .001
Tan et al. (2022)	Self-care ability scale	Self-efficacy	24.0±4.27	15.3±3.87	< .05
	Stoma-QoL	QoL	25.63±5.65	50.33±6.24	< .05
	Stoma complications	Complications	7	19	< .05
Hao et al. (2023)	SCSE	Self-efficacy	114.46±11.43	83.60±10.47	< .001
	ESCAb	Adaptation	36.26±2.55	32.00±2.86	< .001
	STAI	Anxiety	34.44±3.61	49.54±3.14	< .001
	SF-36	QoL	65.26±3.23	60.48±3.18	< .001
	Stoma complications	Complications	16	35	< .001
Ko et al. (2023)	Stoma care ability	Adaptation	24(21.0-28.0)	16(12.0-20.0)	< .001
	Stoma-QoL	QoL	105.5(87.2~112.0)	74.0(65.7~92.5)	< .001
Krouse et al. (2023)	PAM	Adaptation	70.2±15.1	69.5±16.3	NR
	SE	Self-efficacy	7.1±2.2	6.3±2.5	.016
	COH-QOL-O	QoL	6.7±1.6	6.8±1.6	NR
	HAS	Depression	5.3±4.0	5.1±4.0	NR
	HDS	Anxiety	5.9±4.1	5.8±3.9	NR
Rock et al. (2023)	Physician phone consultation	Adaptation	.232	.072	< .05
	Frequency of self-care activities	Adaptation	.431	.509	NR
	Time spent on self-care activities	Adaptation	.146	.101	NR
	Skin problems	Complications	.199	.179	NR

Exp.=experimental group; Cont.=control group; NR=no response; OAI-23=Ostomy Adjustment Inventory-23; SSES=Stoma Self-efficacy Scale; GSES=General Self-efficacy Scale; ESCAa=Evaluation of Self-care Ability Scale; SF-36=Short Form Health Survey-36; SAS=Self-rating Anxiety Scale; SDS=Self-rating Depression Scale; Stoma-QOL=Stoma Quality of Life Scale; SCSE=Stoma Care Self-efficacy Scale; ESCAb=Exercise of Self-care Agency Scale; PAM=Patient Activation Measure; SE=Self-efficacy for Ostomy Patients; COH-QOL-O=City of Hope Quality of Life Colorectal; HAS=Hospital Anxiety Scale; HDS=Hospital Depression Scale.

of life and ostomy complications were assessed. This study reviewed the instruments used in the included studies and presented the effectiveness of the interventions based on the reported results (Table 3).

### 3.3.1 Adjustment to ostomy

Online education programs partially improved ostomy adjustment scores. Of the seven studies[A1–A3,A5–A8] that analyzed ostomy adjustment post-intervention, six[A1–A3,A5,A6,A8] showed statistically significant increases in the experimental group. The remaining studies[A7,A8] mentioned a lack of online information sharing with other patients, and a significant improvement was observed in the experimental group six months after the intervention.

### 3.3.2 Ostomy self-efficacy

Online education programs generally enhanced self-efficacy scores. All five studies[A1,A2,A4,A5,A7] that analyzed ostomy self-efficacy post-intervention reported statistically significant increases in the experimental group.

### 3.3.3 Ostomy complication

Online education programs partially reduced ostomy-related complications. Of five studies[A1, A2,A4,A5,A8], three[A2,A4,A5] showed statistically significant decreases in complications in the experimental group. The authors of the remaining two studies[A1,A8], in which no significant differences were found, mentioned that timely treatment was being provided for the complications.

### 3.3.4 Depression and anxiety

Online education programs partially alleviate depression and anxiety. Of three studies[A2,A5, A7], two reported statistically significant reductions in the experimental group. In the study[A7] with no significant difference, a significant improvement was observed in the experimental group six months after the intervention.

### 3.3.5 Quality of Life

Online education programs partially enhance quality of life. Of five studies[A2,A4–7], four[A2,A4, A5,A6] reported statistically significant improvements in the experimental group. In the study[A7] with no significant difference, a significant improvement was observed in the experimental group six months after the intervention.

## 3.4 Quality Appraisal of the Literature

Figure 2 presents the quality ratings of the eight included studies. RoB 2 was used to assess the risk of bias according to the quality assessment criteria, and the results were input into RevMan. Among the eight studies, five[A1,A3,A5,A7,A8] had a low risk of bias in random sequence generation, one[A2] had a high risk, and two[A4, A6] were unclear. Regarding allocation concealment, four studies[A1, A3,A7,A8] had a low risk of bias, three[A2,A4,A6] had a high risk, and one[A5] was unclear. Regarding blinding of participants and personnel, four studies[A1,A3,A7, A8] had a low risk, and four[A2,A4–A6] had a high risk. Regarding blinding of outcome assessment, all eight studies had a low risk. Regarding incomplete outcome data, seven studies[A1–A4,A6–A8] had a low risk, and one[A5] had a high risk. Selective reporting bias was rated low in all eight studies. The inclusion criteria for the literature were RCTs with clear pre- and post-assessments and expected outcomes. Overall, the quality of the studies was considered moderate to high (Figure 2).

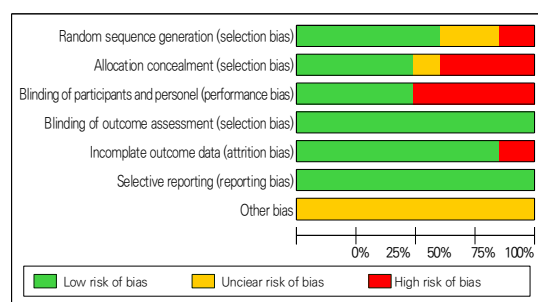


Fig. 2a. Quality assessment: Risk of bias graph.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (selection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Hao et al. (2023)	+	?	-	+	-	+	?
Heidari-Berai et al. (2023)	+	+	+	+	+	+	?
Huang et al. (2023)	-	-	-	+	+	+	?
Ko et al. (2023)	?	-	-	+	+	+	?
Krouse et al. (2023)	+	+	+	+	+	+	?
Rock et al. (2023)	+	+	+	+	+	+	?
Ten et al. (2023)	?	-	-	+	+	+	?
Wang et al. (2023)	+	+	+	+	+	+	?

Fig. 2b. Quality assessment: Risk of bias summary.

### 3. Discussion

Ostomates face a range of physical, psychological, and social challenges after surgery. However, early adaptation to the ostomy can facilitate a swift return to normal daily life and prevent complications, thereby enhancing quality of life[14]. Traditionally, face-to-face ostomy care education was provided to inpatients during their hospital stay, with follow-up education offered during outpatient visits after discharge. However, a surge in research on online education programs has recently occurred, which prompted this systematic review of existent RCTs to analyze and evaluate the effects of online education for ostomates.

The education program induced in the studies were telehealth program that allowed patients to communicate with nurses through chat or video calls (three studies), mobile applications (three studies), and multimedia learning education that enabled easy and repeated access (two studies). The primary findings indicated that, compared

with face-to-face education, online education programs can enhance ostomates' adjustment to the ostomy and self-efficacy, reduce ostomy complications, and improve quality of life.

The eight selected studies were published between 2018 and 2023, with four of them published in 2023, indicating that online education is becoming increasingly popular. Moreover, these results suggest that the trend and demand for online education will continue to rise[18].

Only four of the included studies were RCTs with blinding, emphasizing the need for more rigorous research in this area. Two studies were at high risk of bias owing to confounding factors. The effectiveness of the education programs can be influenced by various participant characteristics, including age, educational level, and presence of caregivers. Therefore, future studies should employ statistical methods such as regression analysis, stratification, and matching to offset the bias [19]. To conclusively demonstrate the effectiveness of education programs, study designs that can prove that no other variables besides the intervention influenced the outcome measures should be employed.

The participants included a range of individuals with ileostomies, colostomies, and urostomies, suggesting that the education programs can be applied to a diverse range of ostomates. The flexibility of accessing the intervention programs at any time emphasizes the advantage of online platforms in planning and accommodating individual needs whenever and wherever necessary[20,21]. Moreover, five studies demonstrated that video chats and telehealth consultations allowed for immediate communication and timely feedback between patients and nurses, emphasizing one of the key benefits of online intervention programs [12,11]. Three studies included personalized education programs and nursing content tailored to the characteristics of the participants, as well as activities for sharing experiences and information



with other patients, thereby providing social and psychological support. This suggests that online education programs address the high unmet needs in the areas of individual consultations and psychological issues among ostomates[22].

The most common topics in the interventions included knowledge of ostomy, self-care, and complication prevention, with three studies incorporating psychological support. Ostomates face numerous challenges that impact their quality of life, including discomfort from the ostomy itself, depression, sexual issues, and concerns regarding the noise from the artificial anus[23]. Therefore, various programs that monitor patients' sex-related issues and psychological states, including anxiety and depression, are required.

Wang et al. (2018)[A1] evaluated ostomy adjustment and self-efficacy before patients were discharged and again at one, three, and six months after discharge to assess the effectiveness of the intervention. In their study, patients' scores increased over time, with statistically significant differences between the two groups. Krouse et al. (2023)[A7] reported that the intervention was effective in addressing anxiety, depression, and quality of life six months after the intervention. Rock et al. (2022)[A8] reported statistically significant differences in ostomy adjustment and complications between groups six months after the intervention. These results were consistent with the findings of an RCT that reported that the effectiveness of the intervention was more pronounced, compared with the control group, six months after the intervention than immediately after the intervention[24] and previous findings suggesting that patients have trouble maintaining daily routines for a year after colon cancer surgery [25]. These findings emphasize the need for examining the long-term effects of interventions.

The effectiveness of the education programs was analyzed in four areas: adjustment to ostomy, self-efficacy, emotional aspects such as anxiety

and depression, and overall quality of life and incidence of ostomy complications. All included studies, except one, used self-report measures with established reliability and validity to determine the effects of education. However, one study assessed the actual time spent on ostomy care, cost, and the number of pouches used, suggesting that in addition to self-report measures, objective methods such as observation or video recordings, as well as qualitative evaluations such as readmission rates and medical costs, could be used to assess the practical effectiveness of the education[26]. In addition, including family members in ostomy care education is crucial for maximizing educational outcomes[27] and given the difficulty of adequately educating caregivers before discharge, interventions that promote continuous management following discharge are actively provided[28]. Therefore, future studies should examine the effects of online education on caregivers.

Given that acute care facilities aim to reduce the length of hospital stays for efficiency, patients should be prepared for intensive self-care at home after discharge [30]. Online management allows healthcare professionals to easily monitor patients remotely and assist patients in managing complications related to ostomy, outpatient schedules, diet, nutrition, and weight. Online platforms can be utilized to provide specific interventions such as emotional and social support, supportive communication, active listening, and counseling to address and prevent psychosocial issues, which ultimately improves the quality of life [30]. Reportedly, cancer patients who received telehealth services during the COVID-19 pandemic wanted their healthcare professionals to consider and support their emotional aspects[31]. Therefore, ostomy nurses should not only determine patients' symptoms and provide related consultation and education in online self-care programs. In addition the development and implementation of online-based intervention programs will be needed to

provide participants with online self-help groups for emotional support and ongoing interaction with healthcare providers.

#### 4. Conclusion

This study aimed to analyze the effectiveness of online education programs for ostomates. The results from the eight included studies indicated that, compared with face-to-face education, online education programs were effective in enhancing the adjustment to and self-efficacy regarding ostomy, reducing ostomy complications, and improving quality of life. This study is also significant in that it can serve as a basis for the development of self-care intervention programs for ostomates in Korea.

Online education is increasingly being used and its use is expected to continue rising. However, RCTs on this topic are lacking. This highlights the need for more comprehensive analyses that consider various factors influencing educational outcomes. Future studies should incorporate statistical methods to mitigate the risk of bias and consider diverse variables in their study designs. Existent education programs on ostomy typically cover ostomy knowledge, self-care, and complication prevention, with some also including psychological support. However, a noticeable gap exists in programs that specifically address emotional issues such as anxiety and depression, thus emphasizing the need for programs that consider the emotional aspects and monitor the long-term effects of education. Furthermore, this study's findings emphasize the benefits of online education, such as its accessibility and the potential for remote communication between patients and nurses. Future studies should explore the educational impact on family members, including caregivers, and the creation of programs that bolster emotional and social support. In the context of rapidly evolving situations such as the COVID-19 pandemic,

telemedicine is expected to become increasingly significant, and ostomy nurses are required to provide symptom assessment, counseling, education, and emotional support through online self-care education programs. Online ostomy education holds promise as a valuable tool to enhance quality of life and prevent complications among ostomates.

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