

## ORIGINAL RESEARCH

# Application of health education based on the integrated theory of health behavior change in the pelvic floor rehabilitation of patients with cervical cancer after radical surgery

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**Abstract**

To analyze the effect of applying health education based on the integrated theory of health behavior change in the pelvic floor rehabilitation of patients with cervical cancer after radical surgery. We recruited 130 patients with cervical cancer who underwent gynecological surgery in our hospital between the 01 February 2021 and the 01 March 2022. According to the random number table method, the patients were divided into a control group and an observation group (65 cases per group). The control group received routine health education, while the observation group received health education based on the integrated theory of health behavior change. We compared the two groups with regards to pelvic floor function, quality-of-life, and psychological status before and after intervention by analyzing PFDI-20 (Pelvic Floor Distress Inventory Questionnaire-20), PFIQ-7 (Pelvic Floor Impact Questionnaire-7), HAMA (Hamilton Anxiety Scale) and HAMD (Hamilton Depression Scale) questionnaires, treatment compliance and nursing satisfaction. After intervention, the PFDI-20 scores and total scores of patients in the observation group were lower than those in the control group ( $p < 0.05$ ). The PFIQ-7 scores and total scores of patients in the observation group were lower than those in the control group ( $p < 0.05$ ). The HAMA and HAMD scores in the observation group were significantly lower than those in the control group ( $p < 0.05$ ). The treatment compliance and nursing satisfaction rate of patients in the observation group were higher than those in the control group ( $p < 0.05$ ). Health education based on the integrated theory of health behavior change can improve pelvic floor muscle strength, the quality-of-life, and the treatment compliance of patients after radical surgery for cervical cancer. In addition, this strategy can alleviate anxiety and depression, and improve nursing satisfaction and is worthy of wider clinical application.

**Keywords**

Cervical cancer; Integrative theory of health behavior change; Health education; Pelvic floor rehabilitation; Quality-of-life

## 1. Introduction

Globally, cervical cancer has the fourth highest incidence and mortality rates of all malignant tumors in females. In recent years, the age of onset for cervical cancer has shown a reducing trend. The most common treatment for cervical cancer is radical hysterectomy [1]; this removes most of the uterus and is combined with lymph node dissection. Patients with a high risk of cervical cancer need to receive postoperative radiotherapy or chemotherapy. Thus, patients face greater levels of postoperative trauma [2]. It has been reported that patients who have received radical hysterectomy have a high 5-year survival rate while their quality-of-life decreases significantly, mainly due to pelvic floor dysfunction [3]. Pelvic

floor dysfunction includes urinary incontinence, constipation, pelvic organ prolapse and female sexual dysfunction; these factors can seriously affect a patient's postoperative life. Moreover, this condition can cause anxiety, depression, and an inferiority complex, thus hindering patients from developing normal social relationships [4]. Following surgery, patients can effectively improve their urinary and bowel function by performing regular pelvic floor muscle exercises. However, a large proportion of patients with cervical cancer ignore pelvic floor exercise after surgery. Furthermore, due to a lack of supervision and management, only 23% of patients insist on performing exercise, thus signifying a poor rate of compliance [5]. The integrated theory of health behavior change is a patient-centered clinical care theory proposed in 2009 by Ryan,

an American expert in the field of clinical care. This theory integrates the core ideas of health behavior change theory, social cognitive theory, self-regulation theory, and other theories and can help patients participate and change their health behavior [6, 7]. This study focuses on the application of health education based on the integrated theory of health behavior change in the pelvic floor rehabilitation of patients with cervical cancer after radical surgery. We also provide analysis of the clinical effect of this strategy.

## 2. Materials and methods

### 2.1 Basic information

We recruited 130 patients with cervical cancer who underwent gynecological surgery in our hospital between the 01 February 2021 and the 01 March 2022. The inclusion criteria were as follows: (1) all patients met the diagnostic criteria for cervical cancer described in “Clinical Obstetrics and Gynecology” [8], and were diagnosed with cervical cancer by pathological examination; (2) all patients had indications that were in line with cervical cancer and stage IIa cervical cancer, and (3) all patients were predicted to survive for more than six months after treatment. The exclusion criteria were as follows: (1) patients who had other serious systemic diseases or tumors in other parts of the uterus, (2) patients who had undergone urological surgery or pelvic surgery prior to treatment, (3) patients with disorders of cognition, communication and mental health, (4) patients with chronic cough and asthma, and (5) patients who did not cooperate with the study or quit.

All patients were numbered according to the sequence of convenient sampling selection. SPSS 22.0 (Statistical Package for Social Sciences 22.0, IBM, Armonk, NY, USA) was used to generate random numbers in two groups by another medical provider who did not participate in the subsequent intervention. These random numbers were placed into a sealed envelope. When all patients who met the inclusion and exclusion criteria agreed to take part in the study, the envelopes were issued to the researchers. Thus, the patients were divided into a control group and an intervention group (65 cases per group).

## 2.2 Methodology

### 2.2.1 Control group

Patients in the control group were treated by routine nursing care, including admission assessment, preoperative intestinal and vaginal preparation, psychological intervention, health education, postoperative catheter nursing, life nursing, complication prevention, discharge, and follow-up guidance.

### 2.2.2 Observation group

(1) A nursing team was organized to oversee the integrated theory of health behavior change. The team included two gynecological attendings, one psychotherapist, one therapist for pelvic floor rehabilitation, and four gynecological specialist nurses. All members had a bachelor’s degree or above and had worked in their fields for at least five years. The attendings prepared a rehabilitation plan for the patients. The psychotherapist assessed the psychological states of the patients and provided interventions. The therapist provided guidance relating to

pelvic floor rehabilitation to the nurses, while the specialist nurses implemented the plan and made summaries. All of these members were trained for one month in the integrated theory of health behavior change and in cervical cancer by means of lectures and on-line classes. All members passed a hospital examination. Based on the integrated theory of health behavior change, there are four stages of health education: pre-contemplation and contemplation, preparation, action and maintenance.

(2) The stage of pre-contemplation and contemplation. In this stage, the main task is to gain an understanding of a patient’s cognition and their understanding of cervical cancer and pelvic floor rehabilitation, in order to correct their misunderstandings and improve their health beliefs. Members of the team taught patients about cervical cancer by handing out educational manuals, organizing health lectures, broadcasting videos and teaching online. In addition, the patients were informed of precautions for cervical cancer rehabilitation and pelvic floor exercise. When dealing with elderly patients, the team members could raise their voices, reduce their rate of speech, and use videos to improve understanding. For young patients and those who had a good understanding, the team members were able to provide help, find relevant information on the internet and tell them to exercise at home according to instructions on WeChat. Following discharge, the team conducted at least one health lecture every month and invited patients who had good postoperative recovery to share their experience in health care and exercise. With these efforts, patients were able to strengthen their motivation and belief in postoperative rehabilitation.

(3) Preparation stage: All team members were made to be fully aware of patient condition, basic information, treatment methods, personal lifestyle, and family situation. Then, the team worked with the patients and their families to generate rehabilitation plans, including diets, exercise schedules, medication management, disease monitoring, and review. Patients signed commitment letters; in these commitment letters, patients set out their health management or postoperative rehabilitation goals, such as how to conduct pelvic floor function training and how to take medicine as prescribed by the doctor. Patients were encouraged to make commitments, strengthen their self-restraint ability, and be supervised by their caregivers following discharge. Doctors and nurses should pay much attention to the psychological changes of changes when they are in hospital and during follow-up visits. Doctors should provide emotional incentives to patients under the guidance of psychotherapists by giving positive guidance and psychological suggestions or mindfulness training methods.

(4) Action stage: In the action stage, team members helped patients to generate postoperative rehabilitation plans, change their inappropriate living habits, and strengthen postoperative supervision. Patients also formulated feasible goals for postoperative rehabilitation, such as “mastering pelvic floor muscle exercises within 1 month” and “timely review”. Team members summarized and comprehensively analyzed the factors affecting postoperative rehabilitation and pelvic floor exercises, formulated rehabilitation plans, and helped patients obtain timely health knowledge through the WeChat platform after discharge. Patient’s families were told about the importance

of companionship and supervision and allowed to participate in the treatment and prognosis so that they could supervise patient training sessions at home after discharge. Pelvic floor muscle exercises after discharge can be divided into Kegel exercises and vaginal weightlifting, as described below.

1. Kegel exercises: Patients were asked to take a comfortable position. The patients could sit in a chair, lie on the floor or just stand, making sure that their leg and abdominal muscles were relaxed. Beginners squeezed their pelvic floor muscles for three seconds, and then released their muscles for five seconds before repeating the exercise. It was important to leave sufficient time to relax as this practice can avoid both strain and increased muscle tone. After a few exercise sessions, the patients extended their squeezing time to five seconds and released their muscles for 5 to 10 seconds. The patients could perform exercise for 15 minutes to 20 minutes a day.

2. Vaginal weightlifting: Patients should use the lightest No. 1 dumbbell at first. After cleaning the dumbbell and putting it in the vagina, the patient was asked to lie down and gradually shift to a semi-recumbent and standing position, with the legs separated and the dumbbell clamped by the pelvic floor muscles. The patient held the dumbbell for 3–5 s and then relaxed for 8–10 s. The patient then repeated this process 20 times as a set and perform 3 sets a day. When the patient could hold the dumbbell in the standing position, she was able to use a No. 2 dumbbell. This exercise involves 5 dumbbells in total. The team members provided one-to-one instruction and demonstration until the patient fully understood the exercise.

(5) Maintenance stage: The nursing staff supervised patient behavior and cognitive changes through telephone follow-up (twice a month), home visits (once per month) and communication in WeChat (the nursing staff answered questions raised by the patients and their families at the same time every day).

## 2.3 Indicators

Patients in both groups received follow-up visits for three months.

Primary outcome indicators included the following:

(1) The Pelvic Floor Distress Inventory-20 (PFDI-20) [9] was adopted to compare pelvic floor functions before intervention (on admission) and after intervention (3 months after discharge). This comprised of three scales, including the Urinary Distress Inventory-6 (UDI-6), Pelvic Organ Prolapse Distress Inventory-6 (POPDI-6), and the Colorectal-Anal Distress Inventory-8 (CRADI-8). This has 20 items, with 4 points for each item. The scale scores were determined individually by calculating the mean value of their corresponding questions and then multiplying by 25 to obtain a value that ranged from 0 to 100. The sum of the three scales were added together to obtain the PFDI-20 summary score, which ranged from 0 to 300. The higher the score, the greater the perceived impact that pelvic floor dysfunction has on a patient's life.

(2) The Pelvic Floor Impact Questionnaire-7 (PFIQ-7) [10] was used to compare the quality-of-life before intervention (on admission) and after intervention (3 months after discharge). This includes three scales, the Urinary Impact Questionnaire (UIQ-7), Pelvic Organ Prolapse Impact Questionnaire (POPIQ-7), and the Colorectal-Anal Impact Questionnaire-7

(CRAIQ-7). 21 questions are included in the three scales. To obtain scale scores, the mean of each of the three scales was individually calculated, which ranged from 0–3; this number was then multiplied by 100 and then divided by 3. The scale scores were then added together to obtain the total PFIQ-7 score, which ranged from 0–300. A lower score implies a reduced effect on the quality-of-life.

Secondary outcome indicators included the following:

(1) The Hamilton Anxiety Scale (HAMA) and Hamilton Depression Scale (HAMD) [11] were adopted to compare mental states before intervention (on admission) and after intervention (3 months after discharge). The two scales were created by Hamilton in 1960. Each item was scored on a basic numeric scoring of 0 to 4. The HAMA has 14 items. Scores  $\geq 29$  indicate severe anxiety; scores  $\geq 21$  indicate obvious anxiety; scores  $\geq 14$  indicate anxiety; scores  $\geq 7$  indicate potential anxiety; scores  $< 7$  indicate no anxiety. The HAMD has 17 items. Scores  $\geq 24$  indicate severe depression; scores  $\geq 14$  indicate depression; scores  $\geq 7$  indicate potential depression; scores  $< 7$  indicate no depression.

(2) We compared treatment compliance between the two groups three months after discharge [12]. This was divided into complete compliance, partial compliance, and non-compliance. Complete compliance means that the patient will actively cooperate with the treatment, take drugs punctually, and accept all related examinations. Partial compliance means that the patient will cooperate with the treatment, take drugs and accept related examinations. Non-compliance means that the patient will not cooperate with the treatment and quit the study. Treatment compliance = (complete compliance + partial compliance)/number.

(3) We compared nursing satisfaction between the two groups three months after discharge. The satisfaction scale was created by our hospital and evaluated by the head nurse. This scale passed validity and reliability testing. According to the opinions and suggestions of nursing experts, four items were evaluated, including health education, nursing service, service skills and overall evaluation. This adopts a Likert 5-level scoring method. The full score is 100; a score  $> 90$  indicates very satisfied, 70–89 indicates satisfied, 60–69 indicates average,  $< 60$  indicates not satisfied. Nursing satisfaction = (very satisfied + satisfied)/number  $\times 100\%$ .

## 2.4 Statistical analysis

Statistical software SPSS 22.0 was used for analysis. The count data are described by n and %, and the  $\chi^2$  test was applied. Measurement data are described as mean  $\pm$  standard deviation according to the distribution characteristics, and the *t* test was adopted.  $p < 0.05$  was considered statistically significant.

## 3. Results

### 3.1 Comparison of basic information

There was no significant difference between the two groups in terms of basic information ( $p > 0.05$ ). More details are given in Table 1.

TABLE 1. Comparison of basic information ( $\bar{x} \pm s$ ).

Group	Number	Average Age	Gravida	Pregnancy	Histological classification			Operation method	
					Squamous cell carcinoma	Adenocarcinoma	Adenosquamous carcinoma	Laparotomy	Peritoneoscope
Control team	65	39.78 ± 7.43	1.69 ± 1.26	0.95 ± 0.81	46	14	5	41	24
Observation team	65	40.29 ± 8.10	1.72 ± 1.40	0.94 ± 0.91	48	11	6	43	22
$\chi^2/t$		0.374	0.128	0.066		0.494		0.135	
$p$		0.709	0.898	0.947		0.781		0.714	

### 3.2 Comparison of pelvic organ prolapse scores of patients before and after intervention

Before the intervention, there was no significant difference between the two groups in terms of the scores of the PFDI-20 ( $p > 0.05$ ). After the intervention, the scores in the observation group were lower than those in the control group ( $p < 0.05$ ). More details are given in Table 2.

### 3.3 Comparison of the quality-of-life before and after intervention

Before the intervention, there was no significant difference in the PFIQ-7 scores of patients when compared between the two groups ( $p > 0.05$ ). After the intervention, the scores of patients in the observation group were lower than those in the control group ( $p < 0.05$ ). More details are given in Table 3.

### 3.4 Comparison of psychological states in patients before and after intervention

Before intervention, there was no significant difference in HAMA and HAMD scores in patients when compared between the two groups ( $p > 0.05$ ). After the intervention, the scores of patients in the observation group were lower than those in the control group ( $p < 0.05$ ). More details are given in Table 4.

### 3.5 Comparison of treatment compliance

The treatment compliance of patients in the observation group was 95.4%; this was higher than in the control group (83.1%;  $p < 0.05$ ). More details are given in Table 5.

### 3.6 Comparison of nursing satisfaction

The nursing satisfaction of patients in the observation group was 96.9%; this was higher than that in the control team (80%;  $p < 0.05$ ). More details are given in Table 6.

## 4. Discussion

Cervical cancer is a gynecological malignancy with the highest incidence. Radical resection surgery can effectively remove these lesions and reduce the possibility of residual lesions. However, due to the large surgical trauma and wide resection

range, this type of surgery will damage the pelvic structure and nervous tissue of patients, thus affecting their bodies and even their quality-of-life [13]. Previous studies have shown that bladder dysfunction, rectal dysfunction and basin anatomical structure changes are common complications after radical resection surgery for cervical cancer [14, 15]. The main symptoms are urinary incontinence, urinary retention, changed bowel habits, constipation, fecal incontinence, and prolapse of the vaginal vault. In addition, radical resection surgery can also impair ovarian blood supply and affect ovarian function, thus resulting in the reduced secretion of ovarian hormones. Thus, the estrogen levels in patients after cervical cancer surgery are low, thus leading to a flaccid and weak pelvic floor structure [16]. Clinically, the most preferred intervention for patients who have received radical resection surgery is pelvic floor muscle exercise, which can improve pelvic floor muscle function through repeated and voluntary contractions with different intensities [17]. However, studies have shown that the most important factor for these patients in terms of exercising for a long time is not the severity of their symptoms, but their perception of benefits and confidence in treatment [18]. Therefore, it is necessary to carry out targeted health education for patients undergoing cervical cancer surgery.

We found that the scores that the PFDI-20 and PFIQ-7 scores in the observation group were lower than those in the control group; these data were consistent with the findings of Rejeski *et al.* [19, 20], thus indicating that health education based on the integrated theory of health behavior change can improve pelvic floor muscle strength and quality-of-life after radical resection surgery. During the stage of pre-contemplation and contemplation, health education based on the integrated theory of health behavior change was applied to correct the patient's incorrect understanding about cervical cancer and post-operative training. During this process, we disseminated correct disease management and exercise methods to patients and their families in a step-by-step manner. We also carried out health education through WeChat and telephone, helping patients to improve their understanding about the disease and about how to care about themselves, thus making them aware of the risks of being not compliant with medical advice, and of the many benefits of postoperative exercise. Thus, patients will be motivated to change their



**TABLE 2. Comparison of pelvic organ prolapse scores in patients before and after intervention ( $\bar{x} \pm s$ ).**

Group	Number	Pelvic organ prolapse		Anorectal disorders	
		Before intervention	After intervention	Before intervention	After intervention
Control team	65	75.82 ± 4.84	49.75 ± 7.31	67.31 ± 5.92	38.74 ± 3.10
Observation team	65	74.74 ± 4.84	40.17 ± 2.93	67.58 ± 6.12	31.32 ± 4.04
<i>t</i>		1.272	9.807	0.256	11.748
<i>p</i>		0.206	<0.001	0.799	<0.001
Group	Number	Urogenital disorders		Total	
		Before intervention	After intervention	Before intervention	After intervention
Control team	65	71.54 ± 4.39	47.18 ± 5.27	214.66 ± 9.70	135.68 ± 10.86
Observation team	65	71.06 ± 4.05	39.66 ± 3.16	213.38 ± 9.99	111.15 ± 6.73
<i>t</i>		0.648	9.867	0.741	15.479
<i>p</i>		0.518	<0.001	0.460	<0.001

**TABLE 3. Comparison of the quality-of-life before and after intervention ( $\bar{x} \pm s$ ).**

Group	Number	Urinary incontinence		Pelvic organ prolapse	
		Before intervention	After intervention	Before intervention	After intervention
Control team	65	78.31 ± 4.42	52.60 ± 6.11	70.12 ± 5.40	46.15 ± 5.59
Observation team	65	78.49 ± 3.30	39.88 ± 2.46	69.28 ± 4.73	40.17 ± 3.37
<i>t</i>		0.263	15.570	0.943	6.736
<i>p</i>		0.793	<0.001	0.382	<0.001
Group	Number	Anorectal disorder		Total	
		Before intervention	After intervention	Before intervention	After intervention
Control team	65	73.91 ± 6.24	48.06 ± 3.74	222.34 ± 9.43	146.82 ± 9.34
Observation team	65	74.40 ± 4.09	40.65 ± 2.89	222.17 ± 7.79	120.69 ± 5.63
<i>t</i>		0.529	12.640	0.166	33.713
<i>p</i>		0.597	<0.001	0.868	<0.001

**TABLE 4. Comparison of the psychological states of patients before and after intervention ( $\bar{x} \pm s$ ).**

Group	Number	HAMA		HAMD	
		Before intervention	After intervention	Before intervention	After intervention
Control team	65	21.63 ± 3.74	18.49 ± 4.14	11.54 ± 2.61	9.74 ± 2.34
Observation team	65	21.11 ± 3.77	16.18 ± 3.05	11.23 ± 2.81	7.80 ± 1.27
<i>t</i>		0.789	3.622	0.652	2.223
<i>p</i>		0.431	<0.001	0.516	0.030

HAMA: Hamilton Depression Scale; HAMD: Hamilton Anxiety Scale.

**TABLE 5. Comparison of treatment compliance (n (%)).**

Group	Number	Complete compliance	Partial compliance	Non-compliance	Treatment compliance
Control team	65	37 (56.9)	17 (26.2)	11 (16.9)	54 (83.1)
Observation team	65	43 (66.2)	19 (29.2)	3 (4.6)	62 (95.4)
$\chi^2$					5.123
<i>p</i>					0.024

**TABLE 6. Comparison of nursing satisfaction (n (%)).**

Group	Number	Very Satisfied	Satisfied	Average	Not satisfied	Nursing satisfaction
Control team	65	30 (46.2)	22 (33.8)	7 (10.8)	6 (9.2)	52 (80.0)
Observation team	65	44 (67.7)	19 (29.2)	2 (3.1)	0	63 (96.9)
$\chi^2$						9.119
<i>p</i>						0.003

behavior [21]. In addition, in the preparation stage, patients in the observation group obtained the relevant information relating to pelvic floor muscle exercise by various routes. The patients were also aware of the skills and precautions involved. Under the supervision of medical staff and family members, our patients did Kegel exercises and vaginal weightlifting so as to promote the neurotransmission of motor neurons that project to muscles and improve the contractile force of the pelvic floor muscle fibers. This can effectively promote local pelvic floor blood circulation and muscle metabolism, and improve pelvic floor function and quality-of-life [22, 23]. Previous studies have shown that there are many reasons why patients are unable to insist on pelvic floor exercises after surgery [24]. One reason is that the doctors did not inform their patients of the importance of these exercises. Another reason is that the patients knew very little about cancer. Furthermore, the patients were unsupervised after being discharged from hospital; they also lack the motivation and self-discipline to exercise. Therefore, in this study, based on the integrated theory of health behavior change, a nursing team containing doctors, nurses, physical therapists, and psychological counselors, was organized. This strategy enriched the overall knowledge of the team, but also helped patients to understand their cancer *via* multiple ways, thus avoiding damaging pelvic floor muscles. Patients with a good prognosis were invited to the lecture to share their experience, thus enhancing patient confidence during recovery. Furthermore, in this study, the family members of patients were encouraged to participate in rehabilitation exercises so that they could support and accompany the patients, and also supervise their exercises. It is helpful for patients to insist on postoperative exercise and overcome difficulties. This strategy can eventually improve a patient's quality-of-life.

These results showed that, after intervention, the HAMA and HAMD scores in the observation team were significantly lower than those in the control team, and the treatment compliance of patients in the observation group was higher than that in the control group. These results were the same as those published previously by Xie [25, 26], thus indicating that health education based on the integrated theory of health behavior change can improve treatment compliance and nursing satisfaction, and reduce the levels of depression and anxiety. Health education based on the integration theory of health behavior change emphasizes a patient's awareness and thus motivates their behavior. This strategy predicts and intervenes in individual health behaviors by changing the daily health behaviors of patients and correcting their misconceptions. When patients change their behavior throughout the treatment and care process, they are developing health behavior [27]. Previ-

ous psychological intervention and health education models for cervical cancer patients were too homogeneous. The one-to-one mode of teaching, along with its different effects, made it difficult to accurately grasp the real-time psychological status of patients [28]. In this study, under the guidance of a psychological counselor, our doctors not only provided patients with one-to-one pelvic floor exercise instruction, but also helped them to distract and relax. Moreover, because family members were also involved in the treatment, patients felt respected and supported. During health lectures, they were also supported by and learned from other patients with a good prognosis, so that they could meet their emotional needs and relieve their negative feelings. Health education based on the integration theory of health behavior change aims to work with patients and their families to make targeted rehabilitation plans for patients who have different life styles. Furthermore, commitment letters are more acceptable to patients, can increase their rehabilitation willingness and treatment compliance [29]. This strategy alleviates the psychological symptoms and physical symptoms of patients with cervical cancer, at least to a certain extent. At the same time, with improvements in scientific and psychological guidance and support, this method not only improves the mental health of patients, but also increases nurse-patient communication and further improves nursing satisfaction [30].

## 5. Conclusions

In conclusion, health education based on the integrated theory of health behavior change can improve the level of pelvic floor muscle strength, improve the quality-of-life, and improve the treatment compliance of patients after radical surgery for cervical cancer. This strategy can alleviate anxiety and depression in patients, and improve nursing satisfaction. This will also improve patient health, reduce the consumption of human and material resources, save medical resources, and enhance the economic benefits of nursing. However, the sample size in this study was relatively small. In the future, more patients should be included in such studies and analyze the long-term effect of health education based on the integrated theory of changes in health behavior change.

## AVAILABILITY OF DATA AND MATERIALS

The authors declare that all data supporting the findings of this study are available within the paper and any raw data can be obtained from the corresponding author upon request.

## AUTHOR CONTRIBUTIONS

QS and XW—designed the study and carried them out; QS, XW, CXY, HMM and LZH—supervised the data collection, analyzed the data, interpreted the data, prepare the manuscript for publication and reviewed the draft of the manuscript. All authors have read and approved the manuscript.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the ethics committee of the First Affiliated Hospital of Soochow University (Approval no. 2021012). Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## REFERENCES

- [1] Buskwofie A, David-West G, Clare CA. A review of cervical cancer: incidence and disparities. *Journal of the National Medical Association*. 2020; 112: 229–232.
- [2] Olusola P, Banerjee HN, Philley JV, Dasgupta S. Human papilloma virus-associated cervical cancer and health disparities. *Cells*. 2019; 8: 622.
- [3] Sundström K, Elfström KM. Advances in cervical cancer prevention: efficacy, effectiveness, elimination? *PLOS Medicine*. 2020; 17: e1003035.
- [4] Zhang YY, Hou JW, Bi XX, Kang JF, Wang Y, Wang YH. The status and influencing factors of alexithymia in female patients with pelvic floor dysfunction. *Nursing Research*. 2023; 37: 554–559. (In Chinese)
- [5] Chen XJ, Zhuang CY, Lin BL, Fu JH, Chen YE, Xing XJ, *et al*. The application research of “5G Internet plus” nursing service mode combined with pelvic floor muscle rehabilitation training to prevent pelvic floor muscle dysfunction after gynecological tumor surgery. *Journal of Cancer Control and Treatment*. 2023; 36: 149–154. (In Chinese)
- [6] Qian CY, Pu Y, Zhao Z, Wang Y. Application effect of health behavior change integration theory in health education of decompensated patients with hepatitis B cirrhosis. *China’s Health Education*. 2021; 37: 179–182. (In Chinese)
- [7] Xie GH, Cheng ZS, Wan YP, Bai XL, Lu YJ, Teng J, *et al*. Application of health education based on the integrated theory of health behavior change in continuous care of patients after mechanical heart valve replacement. *Journal of Nurse Continuing Education*. 2023; 38: 73–76. (In Chinese)
- [8] Gu XY, Zheng RS, Sun KX, Zhang SW, Zeng HM, Zou XN, *et al*. Analysis of the incidence and mortality of cervical cancer in Chinese women in 2014. *Chinese Journal of Oncology*. 2018; 40: 241–246. (In Chinese)
- [9] Li HH. Effects of pelvic floor muscle training on pelvic floor function and quality of life in patients with pelvic floor dysfunction. *China’s Maternal and Child Health Care*. 2018; 33: 748–751. (In Chinese)
- [10] Jiang HY, Huang YL. Effects of pelvic floor muscle functional exercise combined with electromyography stimulation on functional recovery and quality of life in patients with postpartum pelvic floor dysfunction. *Shandong Pharmaceutical*. 2018; 58: 75–77. (In Chinese)
- [11] Duan QQ, Sheng L. Clinical validity of the self rating anxiety and depression scale. *Chinese Journal of Mental Health*. 2012; 26: 676–679. (In Chinese)
- [12] Xu WH, Wang Q, Liang WX. Application of questionnaires or scales in measuring patient compliance. *Prevention and Control of Chronic Diseases in China*. 2007; 15: 403–405. (In Chinese)
- [13] Ma J, Ma LL, Ye JC, Zhao J, Su JP. A study on the status quo and correlation of psychological resilience, symptom groups, and quality of life in middle-aged and elderly patients with pelvic floor dysfunction of cervical cancer. *Chongqing Medicine*. 2023; 52: 477–480. (In Chinese)
- [14] Jiang QH, Chen YM, Zhang RJ. Study on the correlation between symptom group distress and quality of life in patients with advanced cervical cancer undergoing concurrent radiotherapy and chemotherapy. *Chongqing Medicine*. 2023; 52: 225–229, 234. (In Chinese)
- [15] Lei CR, Huang YQ, Gu RH, Li YC. Research on the application effect of “Internet plus” WeChat follow-up model in the nutrition management of cervical cancer patients undergoing radiotherapy and chemotherapy. *Chongqing Medicine*. 2023; 52: 388–392. (In Chinese)
- [16] An CF, Feng XJ, Jin XM. Analysis of risk factors for pelvic floor dysfunction in patients with cervical cancer after radical surgery. *Journal of Practical Cancer*. 2023; 38: 33–35. (In Chinese)
- [17] Tian J, Tan JY. Effect of pelvic floor rehabilitation therapy at different times on postoperative pelvic floor function in patients with cervical cancer undergoing piver III hysterectomy. *Modern Oncology Medicine*. 2023; 31: 156–160. (In Chinese)
- [18] Wang K, Tong YJ, Xu LZ. Effects of pelvic floor muscle comprehensive training combined with low-frequency electrical stimulation on urinary retention and pelvic floor function in patients with cervical cancer after surgery. *Journal of Changchun University of Traditional Chinese Medicine*. 2022; 38: 805–808. (In Chinese)
- [19] Michaelsen MM, Esch T. Motivation and reward mechanisms in health behavior change processes. *Brain Research*. 2021; 1757: 147309.
- [20] Rejeski WJ, Fanning J. Models and theories of health behavior and clinical interventions in aging: a contemporary, integrative approach. *Clinical Interventions in Aging*. 2019; 14: 1007–1019.
- [21] Ferrara G, Kim J, Lin S, Hua J, Seto E. A focused review of smartphone diet-tracking apps: usability, functionality, coherence with behavior change theory, and comparative validity of nutrient intake and energy estimates. *JMIR mHealth and uHealth*. 2019; 7: e9232.
- [22] Luo S, Xie Y, He S, Li J, He C. A study on the effect of nursing intervention based on health behavior change integration theory on patients with limb fracture and its effect on limb function and self-efficacy. *Computational and Mathematical Methods in Medicine*. 2022; 2022: 1–8.
- [23] Michaelsen MM, Esch T. Functional mechanisms of health behavior change techniques: a conceptual review. *Frontiers in Psychology*. 2022; 13: 725644.
- [24] Yin H, Liu Y. The application effect of pelvic floor rehabilitation instrument combined with surgical intervention in the rehabilitation of patients with cervical cancer after surgery. *Modern Instruments and Medical Treatment*. 2022; 28: 78–81.
- [25] Xie LS, Xiong Y, Shuai WW. Effect of rehabilitation nursing based on health behavior change theory on improving pelvic floor and bladder function in patients with cervical cancer after surgery. *Nursing Practice and Research*. 2023; 20: 595–599. (In Chinese)
- [26] Xu LZ, Wang K. Effect analysis of Kegel exercise pelvic floor exercise and bioelectric stimulation on reducing postoperative urinary retention in patients with cervical cancer. *Chinese Journal of Family Planning*. 2022; 30: 2513–2516. (In Chinese)
- [27] Kong R, Zheng J. Observation on the application of pelvic floor muscle rehabilitation nursing under the integrated theory of health behavior change in patients with urinary retention after cervical cancer surgery. *Laboratory Medicine and Clinical Medicine*. 2022; 19: 688–691. (In Chinese)
- [28] Yang XQ, Xu LX, Qi XL, Yang YE, Chen Y, Yu JJ, *et al*. Application of the integrated theory of health behavior change in pelvic floor muscle exercise in patients with pelvic floor dysfunction after early cervical

- cancer surgery. *Chinese Journal of Practical Nursing*. 2020; 36: 2674–2679. (In Chinese)
- [29] Ma C, Xie HW. The impact of mobile health intervention based on the integrated theory of health behavior change on weight management of pregnant women. *Guangxi Medicine*. 2020; 42: 505–508. (In Chinese)
- [30] Ou Yang LJ, Liu DC, Zhang LJ. Application of continuous nursing based on the integrated theory of health behavior change in plastic and breast conserving surgery for breast cancer patients. *Chinese Beauty Medicine*. 2021; 30: 163–166. (In Chinese)

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