

Kegel exercises with a guidebook for stress urinary incontinence treatment

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ABSTRACT

BACKGROUND Stress urinary incontinence (SUI) is uncontrollable urine leakage when intra-abdominal pressure increases. Behavioral therapy with Kegel exercise is currently the best conservative management recommendation for treating SUI patients. This study aimed to investigate the success of supervised Kegel exercises using the Kegel exercises guidebook in women with SUI.

METHODS This quasi-experimental study involved both groups being taught the same regiment of Kegel exercises, but the intervention group was given the Kegel exercises guidebook. After 12 weeks, the compliance, subjective, and objective success rates were evaluated through the patient's notes, Urinary Distress Inventory-6, Incontinence Impact Questionnaire-7, perineometer, and pad test.

RESULTS Patients with a higher level of education had lower compliance to Kegel exercises ($p = 0.01$; odds ratio [OR] 0.38; 0.18–0.79). No significant difference was observed in the subjective symptom improvement between the two groups. The intervention group had a significantly higher success rate based on objective success by analyzing the 1-hour pad test results. The intervention group was also more adherent ($p < 0.001$; OR 4.78; 2.51–9.0).

CONCLUSIONS Patients who received the Kegel exercises guidebook were more compliant and more objectively successful than those who did not receive the manuals.

KEYWORDS exercise therapy, guidebook, pelvic floor, urinary stress incontinence

Stress urinary incontinence (SUI) is defined by the International Continence Society (ICS) as an uncontrollable urine leakage when intra-abdominal pressure increases due to exertion, coughing, or sneezing.¹ This condition is caused by a weakening of the urethral sphincter or pelvic floor muscles that

support the bladder and urethra. Although not life-threatening, SUI greatly affects the quality of life (QoL) of women in various aspects.²

Studies conducted from 2015 to 2016 found that urinary incontinence (UI) affected 53% of women in the United States, and 26% of them had SUI.³ In Indonesia,

the prevalence of SUI in postpartum women is 8.8%.⁴ This condition significantly reduces the patient's QoL. Pizzol et al⁵ reported that patients with UI had a significantly lower QoL as assessed using the Short Form 36 questionnaire. Women with SUI frequently experience psychological problems. They have significantly higher rates of depression, stress, and lower self-esteem than those without SUI.⁶

The cost of SUI treatment is high, resulting in a significant economic burden due to ineffective conservative management. Behavioral therapy with Kegel exercises is currently the best and most efficient conservative management to treat SUI, with a 27–75% success rate.⁷ Dumoulin et al⁸ reported that women with SUI who underwent Kegel exercises were more likely to experience improved signs and symptoms.

The success of Kegel exercises depends on the exercise quality and compliance. Around 25–50% of women cannot activate their pelvic floor correctly, and compliance levels of 33–93% have been reported.⁷ In women, supervised Kegel exercises could have a higher level of correctness and compliance than unsupervised ones.⁷

Establishing a method to monitor patient compliance is crucial; however, there are no available tools for doctors or patients to evaluate adherence to Kegel exercises and the progress of SUI therapy in Indonesia. Using a formulated Kegel exercises guidebook as a supervision tool could increase their effectiveness.⁷ The guidebook used in the present study includes various scores and tests, such as the Urinary Distress Inventory-6 (UDI-6), Incontinence Impact Questionnaire-7 (IIQ-7), perineometer, and pad test, to monitor the subjective and objective aspects. It provides information, monitors Kegel exercises using a diary, and evaluates symptoms. This study aimed to investigate the success of supervised Kegel exercises using the Kegel exercise guidebook for women with SUI.

METHODS

Study design and sample collection

This quasi-experimental study was conducted over 2 years, from August 2020 to September 2022. Participants were recruited consecutively at a single hospital for the intervention group and five different hospitals for the control group. The inclusion criteria were women aged 20–70 years with SUI based on the

1-hour pad test, an excellent cognitive function based on the Montreal Cognitive Assessment–Indonesian version questionnaire, the ability to perform Kegel exercises correctly, and agreeing to sign an informed consent form. Patients with a poor general condition, who underwent anti-incontinence surgery, mixed UI, abnormal genital bleeding, pelvic organ prolapse (POP) above grade 2 based on POP quantification, severe neurological or muscular disease, acute urinary tract infection, pelvic organ malignancy, surgery affecting the pelvic floor, and a history of diseases that affected urinary continence, such as constipation or chronic cough, were excluded. The sample size was calculated based on an experimental clinical study involving two independent groups with dichotomous results. Including dropouts, we obtained a total sample of 170 individuals, with 85 participants in each group.

Initial assessment

We performed an initial assessment using the UDI-6, IIQ-7, 1-hour pad test, and perineometer measurements in all participants. The participants' characteristics measured included age, education, occupation, BMI, and menopause status. BMI was categorized based on Asia-Pacific classification: underweight (<18.5 kg/m²), normal (18.5–22.9 kg/m²), overweight (23–24.9 kg/m²), and obese (≥25 kg/m²).⁹ The two groups received the same Kegel exercise regimen; however, the intervention group followed the Kegel exercise guidebook. The Kegel exercises guidebook was created using the analysis, design, development, implementation, and evaluation (ADDIE) method. ADDIE is a method of creating a training curriculum and tools to practice a particular habit or technique. The Kegel exercises guidebook included the patient's personal information, brief information on SUI and Kegel exercises, UDI-6 and IIQ-7 questionnaires, follow-up schedule, Kegel exercises daily notes, a summary of Kegel exercises progression, and doctor-patient communication notes.

Intervention protocol

The Kegel exercises regimen for both groups consisted of 3–5 sets daily for both slow-twitch (hold the contraction for 5 sec and rest for 5 sec, 5–10 repetitions) and fast-twitch (hold the contraction for 2 sec and rest for 4 sec, 5–10 repetitions) exercises for 12 weeks. The participants were instructed to perform Kegel exercises for assessment, and their

ability to perform them correctly was confirmed by vaginal palpation. Neither group was administered any medication during the study. The participants were scheduled for in-person visits every 4 weeks, with a phone follow-up every 2 weeks. Their compliance (from the patient’s Kegel exercise diary or notes), UDI-6, IIQ-7, 1-hour pad test results, and pelvic floor muscle strength based on the perineometer were examined and monitored every 4 weeks. Compliance was defined as achieving >3,000 Kegel contractions after 12 weeks. These data were further evaluated after 12 weeks to assess subjective and objective success rates.

Statistical analysis

Demographic, clinical, and obstetric data were analyzed and presented descriptively. Data analysis included univariate, bivariate, and multivariate analyses. Univariate analysis was performed on subject characteristics and each study variable to assess the distribution of the variables. Bivariate analysis of the proportion of success and adherence between the two groups was performed using chi-square or Fisher’s tests. Multivariate logistic regression analysis assessed the influence of confounding factors on the outcome and whether the two groups showed significant differences in demographic, clinical, and obstetric data. Statistical analysis was considered significant if the p-value was <0.05 and was performed using the SPSS software version 23 (IBM Corp., USA).

Ethical considerations

Ethical approval was obtained from the Ethics Committee of the Faculty of Medicine, Universitas Indonesia (No: KET-1065/UN2.F1/ETIK/PPM.00.02/2020).

RESULTS

A total of 148 patients with incontinence complaints completed the Questionnaire for Urinary Incontinence Diagnosis and were followed up after 12 weeks of Kegel exercises (Figure 1).

The control group had significantly higher levels of education than the intervention group. Neither group showed significant differences in medical, obstetric, or gynecological characteristics (Table 1).

Multivariate analysis was conducted to identify the impact of the confounding factors on the compliance and success criteria (Table 2). Patients with a higher level of education had lower compliance with Kegel exercises than those with a lower level of education ($p = 0.01$; odds ratio [OR] 0.38; 0.18–0.79). Health workers tend to have a significantly higher clinical success rate ($p = 0.005$; OR 1.36; 1.08–1.72) than housewives.

After 12 weeks of Kegel exercises, there was a significant improvement in the subjective symptoms between the two groups. The details of the UDI-6 and IIQ-7 results are presented in Figures 2, a and b.

In the graph shown in Figure 2a, a significant decrease in the median score of UDI-6 after 12 weeks of Kegel exercises is observed. The median UDI-6 score in the intervention group decreased by 15.3 points. In the control group, the 11.8-point decrease resulted in a significant difference between the initial and final UDI-6 values. However, there was no difference in the UDI-6 score at week 12 of Kegel exercises between the intervention and control groups ($p = 0.465$).

Figure 2b shows a significant decrease in the median value of IIQ-7 after 12 weeks of Kegel exercises in the intervention and control groups.

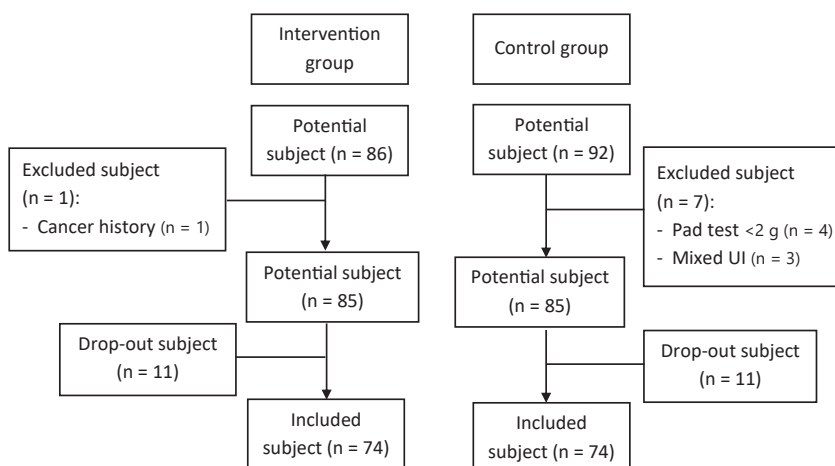


Figure 1. Participant recruitment process

Table 1. Participant characteristics

Characteristics	Groups		<i>p</i>
	Control (N = 74)	Intervention (N = 74)	
Age (years), mean (SD)	45.2 (11.9)	45.1 (9.3)	0.96
Age group (years), n (%)			0.46
20–34	18 (24)	12 (16)	
35–45	19 (26)	22 (30)	
46–69	37 (50)	40 (54)	
Education, n (%)			0.02
Low (elementary– junior high)	8 (11)	13 (18)	
Moderate (senior high)	33 (45)	44 (59)	
High (university)	33 (45)	17 (23)	
Occupation, n (%)			<0.001
Housewife	36 (49)	15 (20)	
Health workers	21 (28)	47 (64)	
Employee/retired	13 (18)	12 (16)	
Others	4 (5)	0 (0)	
BMI (kg/m ²), mean (SD)	26.4 (4.0)	27.5 (5.4)	0.15
BMI (kg/m ²), n (%)			0.44
Underweight/ normoweight	13 (18)	14 (19)	
Overweight	16 (22)	10 (14)	
Obesity grade 1	34 (46)	33 (45)	
Obesity grade 2	11 (15)	17 (23)	
Menopause status, n (%)			0.73
Yes	26 (35)	24 (32)	
No	48 (65)	50 (68)	

BMI=body mass index; SD=standard deviation

In the intervention group, a significant 23.3 points median decrease was observed. The control group also showed a significant decrease with 19 points. However, there were no significant differences in the final median IIQ-7 scores between the intervention and control groups.

As shown in Figure 2c, there were changes in perineometer parameters in both groups after 12 weeks of Kegel exercises. In the control group, there was an increase in the baseline perineometer score of 5.1 cmH₂O after 12 weeks of Kegel exercises (19.2 versus 24.2 cmH₂O). Meanwhile, the perineometer score increased significantly by 9.8 cmH₂O from the baseline value in the intervention group (33.0 versus 23.2

cmH₂O). The pelvic muscle strength of patients in the intervention group was also significantly higher than that in the control group after 12 weeks of exercise (33.0 versus 24.3 cmH₂O).

Furthermore, the intervention group initially had a more severe urine leakage based on the 1-hour pad test (Figure 2d). After 12 weeks of Kegel exercises, both groups experienced decreased urine leakage. However, the decrease in urine leakage in the intervention group was significantly greater (3 g) than in the control group (1.4 g). Multivariate analysis showed that higher patient compliance increased clinical success (*p* = 0.003; OR 1.32; 1.12–1.55).

Based on the clinical success analysis, a 1-hour pad test result of <2 g or reduction of >10 g, the intervention group had a significantly higher success percentage than the control group (87.8% versus 64.8%; *p*<0.001). Based on the subjective success criteria, no significant difference was observed between the percentages of the intervention and control groups (91.9% versus 90.5%, *p*>0.05). Patients in the intervention group were more adherent than those in the control group (43 versus 9 patients; *p*<0.001; OR 4.78; 2.51–9.0).

DISCUSSION

After 12 weeks of Kegel exercises, there was a significant improvement in the subjective symptoms between the two groups. The control group experienced a decrease in the median IIQ-7 score by 19 points, while the intervention group had a 23.3-point decrease. The IIQ-7 assesses the impact of aspects of daily activities affected by distress, such as entertainment, travel, household activities, social activities, and emotions. The higher the IIQ-7 score, the greater the impact or distress on daily activities.¹⁰ A study by Mclean et al¹¹ observed a 31.4-point decrease (40.9–9.5, *p*<0.01) in IIQ score after performing the Kegel exercise for 12 weeks. Meanwhile, Fan et al¹² had a better result with an 8.4-point decrease (31.1–22.2, *p*<0.01) in the IIQ-7 score through 9-month study period.

Using the UDI-6 questionnaire, both groups experienced a decrease in symptoms, marked by a reduction in the median UDI-6 score. The UDI-6 questionnaire measures the severity of the patient's distress or symptoms. The greater the UDI-6 score, the more severe the patient's distress. This finding is in line with the result found by Celiker Tosun et al¹³ where the UDI-6 score decreased from 10.2 to 4.9 (*p*<0.01) after 12

Table 2. Effect of determinant factors on subjective compliance, subjective success, and clinical success

Determinant factors	Subjective compliance		Subjective success		Clinical success	
	OR (95% CI)	<i>p</i> *	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i> *
Education level						
High (university)	0.38 (0.18–0.79)	0.01	0.92 (0.85–1.00)	0.47 [†]	1.26 (0.87–1.82)	0.16
Mid (senior high)	0.90 (0.54–1.51)	0.7	0.88 (0.81–0.96)	0.1 [†]	1.28 (0.90–1.82)	0.1
Low (elementary–junior high)	1.00		1.00		1.00	
Occupation						
Health workers	1.15 (0.70–1.88)	0.58	0.96 (0.85–1.08)	0.48*	1.36 (1.08–1.72)	0.005
Employee	0.93 (0.48–1.81)	0.83	1.05 (0.94–1.16)	0.8 [†]	1.26 (0.95–1.68)	0.12
Housewives	1.00		1.00		1.00	
Maternal compliance						
Yes	-	-	0.95 (0.85–1.07)	0.38 [†]	1.32 (1.12–1.55)	0.003
No	-	-	1.00		1.00	-

CI=confidence interval; OR=odds ratio

Data were analyzed using: *chi-square test, significant if *p*<0.05; [†]Fisher test, significant if *p*<0.05

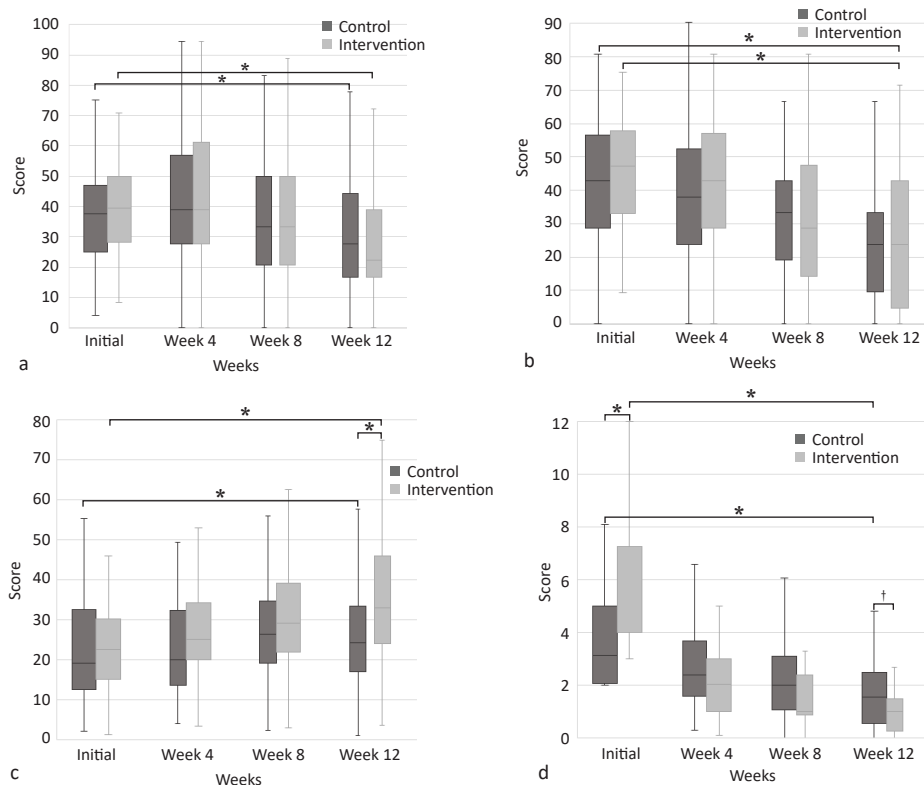


Figure 2. Score improvement based on the study group comparison. (a) UDI-6 score; (b) IIQ-7 score; (c) perineometer score; (d) 1-hour pad score. *Chi-square test, *p*<0.001; [†]Fisher test, *p* = 0.008. IIQ-7=Incontinence Impact Questionnaire-7; UDI-6=Urinary Distress Inventory-6

weeks of practice. In contrast to our finding, Cross et al⁷ showed a significant decrease in the initial UDI-6 value of the intervention group (51.11–40.55, *p*<0.05) and the control group (50.9–43.15, *p*<0.05) after 12 weeks of performing Kegel exercises. Additionally, there was a

significant difference in the final UDI-6 scores between the study and control groups.

The present study found no significant difference between the two groups' reduction in UDI-6 and IIQ-7 scores after 12 weeks of Kegel exercise. Other studies

comparing supervised and unsupervised groups found mixed results. Cross et al⁷ found significantly better QoL improvements in women under supervision more often than in controls. Meanwhile, Kharaji et al¹⁴ obtained similar results to this study, where no differences were found in subjective symptoms or QoL in the supervised group compared to the control group. A systematic review summarizing four pieces of literature found that only 10% of women who were supervised weekly experienced no improvement compared to 43% of women who were not supervised at all (RR 0.29; 0.15–0.55).¹⁵ Even so, a systematic review by Dumoulin et al⁸ did not mention the best supervision schedule; however, they observed more significant symptom improvement in patients with supervised Kegel exercises than in those without supervision.

The absence of differences in the subjective symptoms between the intervention and control groups could be attributed to biofeedback. Biofeedback as a perineometer can help women recognize how the muscles contract during Kegel exercises. In various other studies, using biofeedback can increase the success of Kegel exercises and help women have good and correct contractions.¹⁶ Therefore, with the help of biofeedback, women in the control group subjectively felt the benefits of Kegel exercises for 12 weeks.

The results of previous studies examining the effect of supervision on urine leakage are conflicting. Kargar Jahromi et al¹⁷ found that supervised patients had lower urinary leakage values and frequencies ($p = 0.04$ and $p < 0.01$). Cross et al⁷ also found that supervised Kegel exercises reduced the frequency and severity of SUI based on incontinence severity index scores compared with controls (2.33 versus 3.57, $p < 0.01$). In contrast, Kharaji et al¹⁴ found no difference in the severity or frequency of urine leakage between supervised and independent groups.

When comparing the groups, the intervention group initially had a heavier 1-hour pad test score than the control group. The intervention group showed a sharp decrease in pad test scores in the 4th week, significantly lower than those in the control group by the 8th week. In the 12th week, there was no decrease in median urine leakage in the intervention group, but the difference between the two groups was still significant. Therefore, the number of patients considered clinically successful was higher in the intervention group than in

the control group. When viewed from the success of Kegel exercises in general, these results align with the systematic review by Bø and Hilde,¹⁸ where the success of Kegel exercises in achieving recovery ranged from 44 to 80%. These results were obtained from good Kegel exercises supervision in guidebooks and high patient compliance in intervention studies.

Based on the multivariate analysis, participants with a higher education level were more disobedient than those with a lower education level. Patients with higher education levels tend to be skeptical toward conservative therapy, leading to non-compliance.¹⁹ They have good health literacy and more awareness of better therapeutic options, such as surgery or electromagnets.²⁰ Additionally, multivariate analysis showed that the education level did not impact objective and subjective success, indicating that education did not influence the results of success.

Few studies have evaluated patient adherence to weight and the frequency of urine leakage. Sugaya et al²¹ developed an alarm-like tool to remind patients to perform the Kegel exercises. In their study, women who were more compliant with the Kegel exercises had lower rates of urinary leakage. Asklund et al²² developed a smartphone application to increase adherence, where they found that more obedient women (intervention group) experienced a lower frequency and severity of urine leakage than controls (not using the application), with $p < 0.01$. The low rate of urine leakage in the 1-hour pad test in this study was caused by high patient compliance and the supervision effect of the Kegel exercises guidebook.

One of the main objectives of developing the Kegel exercise guidebook was to increase patient compliance during Kegel exercises. A systematic review by Dumoulin et al⁸ collected evidence on a method for calculating compliance with adherence levels. Ten studies that used diaries and the recall method to record the number of Kegel exercises conducted had adherence rates ranging from 30% to 99.4%, whereas four studies that calculated the presence of direct supervision obtained adherence in a smaller range of approximately 70–98%. Other sources of ICS consensus stated that adherence in short-term therapy (<1 year) was only 64% and 23% in long-term therapy.²³ Long-term adherence (>1 year) was also studied and summarized in a systematic review by Bø and Hilde,¹⁸ showing an adherence rate of Kegel exercises in 1 year across 11 studies ranging

from 10 to 70%. Compared with other studies, the level of adherence in this study was slightly lower (35.1%). This was because of the low adherence of patients in the control group.

In this study, especially in the control group, the reasons for not performing Kegel exercises were forgetfulness, being busy with daily activities, having no reminders, being unable to perform the Kegel exercises, and lacking commitment and understanding of Kegel exercise functions. This is similar to the qualitative research conducted by Navarro-Brazález et al,²⁴ which identified five domains influencing Kegel exercises: the given Kegel exercises regimen (access to information and communicative information providers), Kegel exercises efficacy (positive feelings of the subject, knowledge about Kegel exercises, and development of conditions by the patient), experience undergoing Kegel exercises or other physical therapy, intrinsic factors (self-awareness, beliefs, internal strategies, or motivation), and extrinsic factors (feedback from doctors, conditions, and daily activities). The problems observed in this study are similar to these five domains.

Work type did not affect subjective success, but health workers had significantly higher clinical success rates than housewives. This success may be attributable to high adherence and good health literacy. Therefore, with additional knowledge from handbooks/oral instructions, patients are more likely to perform Kegel exercises correctly and have better intrinsic motivation, resulting in clinical success.

One study showed that motivation plays an essential role in increasing the adherence and success of incontinence therapy. The higher the level of motivation based on the transtheoretical model, the greater the success of the Kegel exercises.²⁵ A systematic review measuring psychosocial factors of therapy success also found that motivation can increase adherence to physical exercise.²⁶ Getting praise for an activity can motivate people to maintain compliance.²⁷ This is due to a biochemical reaction in the brain that occurs when praise is received, encouraging individuals to continue engaging in the same activities to receive happiness from these rewards. Therefore, praise or rewards must be provided to encourage and maintain patient compliance, whereas punishing those who are less compliant is not beneficial.

Efforts are needed to increase and maintain the motivation to perform Kegel exercise therapy. Kegel exercises therapy includes gross motor exercises. A

study stated that motivation can be enhanced by giving praise or rewards when the patient correctly performs the exercise and adheres to the prescribed regimen.²⁷ In this study, rewards were given as praise when the patient was in control and evidence of consistent and adequate Kegel exercises was provided, which showed an increase in the scores of the measured parameters.²⁷

This study has some limitations. The quasi-experimental method was conducted in various research locations and increased sample heterogeneity; no significant association was found between patient compliance and improvement in subjective symptoms. In addition, pelvic floor muscle strength was only evaluated with a perineometer, whereas in SUI treatment, strength was not the only primary modality for reducing SUI symptoms. The coordination and endurance components also play a role in preventing urine leakage.

In conclusion, Kegel exercises improved the clinical and subjective symptoms of patients with SUI. Patients who followed the Kegel exercises guidebook had the same subjective symptom success rate as those in the control group. However, supervision with a guidebook improves compliance, clinical success, and levator ani muscle strength.

Conflict of Interest

Harrina Erlianti Rahardjo is the editorial board member but was not involved in the review or decision making process of the article.

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