

## The Effect of Health-belief-model-Based Training on Behaviors Preventing Peritonitis in Patients on Peritoneal Dialysis

### Abstract

**Background:** Peritonitis is one of the important complications of peritoneal dialysis and one of the reasons for failure of this therapeutic technique. As one of the important reasons for development of peritonitis is disregard for health behaviors, this study aims to investigate the effect of education based on health belief model (HBM) on behaviors preventing peritonitis in peritoneal dialysis patients. **Methods:** This double-blind clinical trial study conducted on 60 patients with peritoneal dialysis in Isfahan, Iran. A researcher-made questionnaire was used to evaluate knowledge, HBM constructs, and peritonitis preventive behaviors in three stages (before, immediately after and 2-month after intervention). The intervention group received four HBM-based educational sessions and the control group received a lecture session. Data were analyzed using Chi-square, Mann-Whitney, Fisher's exact test, independent *t*-test, and repeated measures ANOVA. **Results:** There was no significant difference between the two groups' background variables and level of knowledge, perceived, sensitivity, severity, benefits, barriers, self-efficacy, personal and environmental hygiene behaviors and fluid-replacement technique before the intervention. Immediately after the intervention, all of the variables, except perceived barriers, personal, and environmental hygiene, were significantly higher in the intervention group than the control group ( $P < 0.05$ ); 2 months after the intervention, all of the variables, except personal hygiene and perceived barriers, were significantly higher in the intervention group ( $P < 0.05$ ); in three stages, personal hygiene was not significantly different between the two groups; and 2 months after the intervention, the variable of perceived barriers decreased significantly in the intervention group ( $P < 0.05$ ). **Conclusions:** Education based on HBM is effective on promoting behaviors preventing peritonitis. Education based on HBM is suggested in peritoneal dialysis patients to prevent peritonitis.

**Keywords:** Health belief model, hygiene, Iran, peritoneal dialysis, peritonitis, preventive behavior

### Introduction

Peritonitis is one of the most common complications of peritoneal dialysis. Peritonitis prevalence reported in recent studies ranges from 0.06 to more than 1.66 cases per year. This means that it is expected that, on average, patients undergoing peritoneal dialysis treatment develop peritonitis at least once in every 17 months and at most once every 7 months.<sup>[1]</sup> Peritonitis causes peritoneal dialysis catheter failure and in some cases leads to the removal of the catheter and failure of this therapeutic technique.<sup>[2]</sup> Repeated peritoneal infection can cause irreversible damage to the peritoneum, and the effect can be graver in patients who cannot be hemodialyzed.<sup>[3]</sup> Peritonitis is the main reason for hospitalization and even the

death of these patients. In order for a peritoneal dialysis program to be successful, peritonitis must be prevented.<sup>[4]</sup> The infection caused by Gram-positive bacteria is the most common infection that occurs because of catheter contamination during dialysis fluid exchange. This infection may be due to the improper technique of fluid exchange, inappropriate sanitation of the environment where fluid replacement is carried out, or lack of personal hygiene. Therefore, the related training is necessary for controlling peritonitis.<sup>[5]</sup> Educating these patients is difficult due to such barriers as cognitive impairment because of advanced uremia,<sup>[5]</sup> memory loss,<sup>[6]</sup> physical disorders caused by chronic fatigue, loss of physical strength, and lack of energy,<sup>[7]</sup> old age, different-related diseases, and lack of motivation.<sup>[5]</sup> Psychological problems related to the loss of confidence and the feeling of dependence on technology for survival make the patient worry, and this

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stress aggravates the problems in learning.<sup>[8,9]</sup> Therefore, despite existing training in peritoneal dialysis wards, peritonitis prevalence is still high. The lecture is a common training method in peritoneal dialysis patients, but given the prevalence of peritonitis, it seems that this method of training has not been able to develop preventive behaviors and thus, it needs to be changed.<sup>[10]</sup>

The health belief model (HBM) is one of the main models for teaching preventive behaviors of diseases.

Based on this model, people will select an appropriate behavior to prevent a specific kind of disease if: they find themselves susceptible to a specific disease and feel their health at risk (perceived sensitivity); and recognize the extent of the damage caused by the disease or the bad conditions resulting from an especial behavior (perceived severity of threat); and come to believe that by doing some measures can prevent a specific disease (perceived benefits); and come to the recognition that the benefits of these measures are more than their barriers such as time and cost (perceived barriers); and, finally, see themselves capable of doing these measures and overcoming the barriers (perceived self-efficacy). So far, the impact of this model has been reported on the prevention of Type-A flu,<sup>[11]</sup> brucellosis,<sup>[12]</sup> and smoking.<sup>[13]</sup> Therefore, according to the results of previous studies and the effect of this educational method on healthy individuals for preventing disease, this study aims to determine the effect of HBM-based education on peritonitis preventive behaviors in patients undergoing peritoneal dialysis.

## Methods

This study was a double-blind clinical trial with the registration No. IRCT 2017081135626N1 conducted with the approval of the Ethics Committee of Isfahan University of Medical Sciences, Isfahan, Iran. The study was undertaken in Amin, Ali Asghar, and Al-Zahra Hospital. Sixty peritoneal dialysis patients participated in this study. The sampling method was convenient sampling method. At the first meeting, the purpose of the study was explained and informed written consent was obtained from the patients. Then, through random allocation (drawing from sealed envelopes), the participants were divided into two groups of 30 patients, one being the control group and the other intervention group. Figure 1 presents the flowchart of study participants.

## Data collection

Four questionnaires were used to collect data. The first questionnaire included the background variables of the participants under study (age, sex, level of education, occupational status, duration of treatment with peritoneal dialysis, the cause of chronic renal failure, the status of previous training on the prevention of peritoneal infection and catheter exit site infection, and the frequency of peritoneal infection). The second questionnaire

was a researcher-made questionnaire to assess the peritoneal dialysis patients' knowledge about peritonitis (including 8 questions). This questionnaire together with the third and fourth one was designed using HBM, experiences of peritoneal dialysis nurses, and studying the books and articles published in the area of peritonitis. In this questionnaire, the score of a correct answer was 1 and that of wrong or "I don't know" answer was 0. The third questionnaire was a researcher-made questionnaire in five parts to evaluate the HBM constructs (26 questions). The first part included five questions related to perceived sensitivity, the five questions in the second part were related to perceived threat severity, the third part included five questions related to perceived benefits, the fourth part included four questions about perceived barriers, and the fifth part included seven questions about self-efficacy. The answers to the questions were scored on the 5-point Likert scale. The scores included 5 for "totally agree," 4 for "agree," 3 for "partially agree," 2 for "disagree," and 1 for "totally disagree." The fourth questionnaire was one related to evaluation of preventive behaviors consisting of 33 questions in three

## Subgroups

Subcategories: individual hygiene behaviors (5 questions), environmental hygiene (12 questions), and dialysis-fluid replacement technique hygiene (16 questions). The answers were scored on the 5-point Likert scale for the five options of always, often, sometimes, rarely and never. Scoring was done as in the third questionnaire.

The content validity of the questionnaires was confirmed using the opinions of five nursing experts and two experts from the field of health education and health promotion. The internal consistency of questionnaire constructs (knowledge, HBM constructs, and preventive behaviors) was assessed in a pilot study on 15 participants. Cronbach's alpha coefficient of 79% was obtained for knowledge, 77% was obtained for the HBM, and 76% for preventive behaviors. Reliability of the knowledge, HBM, and preventive behavior questionnaires was confirmed using Guttman split-half coefficient, 80% for knowledge, 81% for the HBM, and 78% for preventive behaviors.

## Educational intervention

For the control group, a training session (40 min) for prevention of peritonitis was held in the form of lecture at the conference hall of the hospital by the researcher. For the intervention group, during four sessions (40 min each one), peritonitis preventive behaviors were trained by the researcher and based on the HBM (a group session and three individual sessions). The group session was held in a different time from that of the control group in the conference hall of the hospital, and individual sessions were held in the peritoneal dialysis ward of the sampling site at intervals of 1 week. The content and structure of the

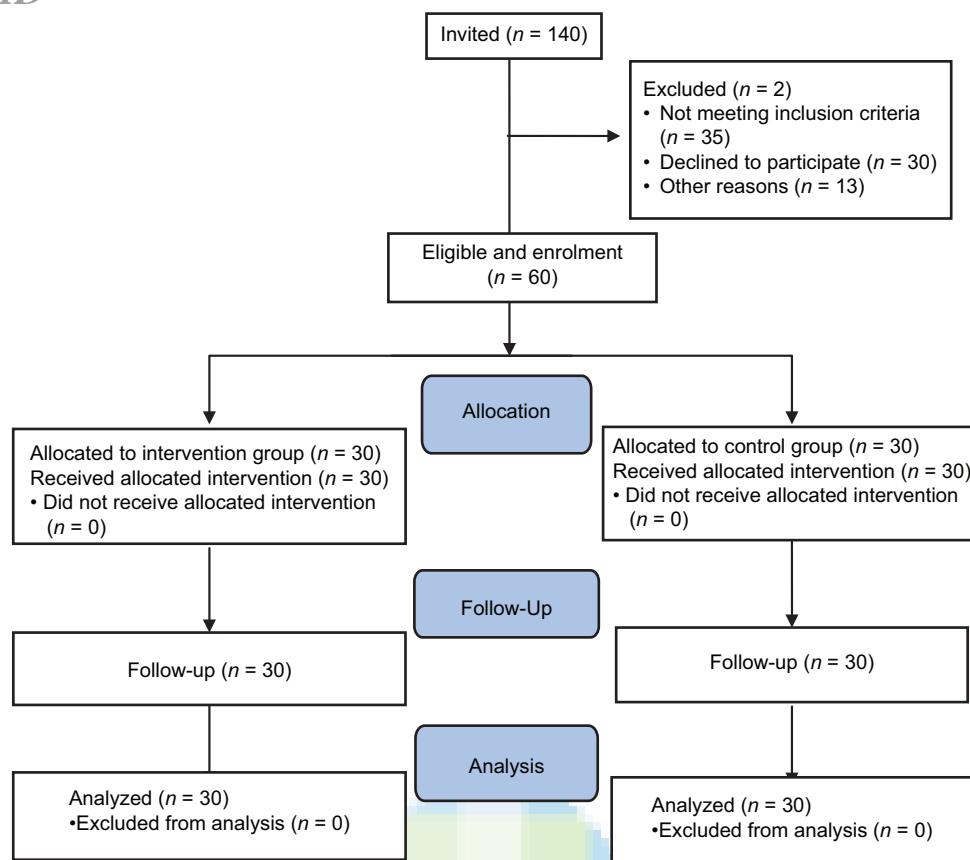


Figure 1: Participant flow and follow up

training sessions were set out by studying books and articles published in the area of the HBM and were approved by five health promotion specialists to ensure that the training content was in compliance with the structured of the HBM.

In these sessions, the samples were provided with the statistics of peritoneal dialysis centers to increase their perceived sensitivity and make them find themselves at high risk. Then, by providing evidence of the peritonitis risks and familiarizing the patients with other patients who had previously experienced the development of peritonitis and the severity of its complications, it was tried to increase the perceived severity of threat in these patients. Finally, it was emphasized that these threats could be overcome if preventive behaviors are observed. Moreover, doing measures such as breaking the steps of fluid replacement technique and personal hygiene procedures into simple, small and practical steps, performing hygiene behaviors for the patients, step by step performance of the behaviors by the patients, correcting the patients' incorrect behaviors, and reducing their stress during the procedure, it was attempted to improve the self-efficacy of the patients.

The structure of training sessions held for the intervention group is as follows.

### First session (group meeting)

The first session included the definition of contamination, sources for transmission of microbes, peritonitis, symptoms of peritonitis, and promotion of perceived sensitivity to exposure to peritonitis.

### Second session (solo session)

Raising the severity of the perceived threat by training the complications of peritonitis and getting acquainted with patients who experienced peritonitis, so that at the end of the session, the patient was able to recall the complications and fully understand their severity and step-by-step training on personal, environmental, and fluid replacement technique hygiene mentioning the benefits of peritonitis preventive behaviors.

### Third session (solo session)

Demonstrating all the steps involved in fluid replacement technique and the related environmental hygiene issues and showing a film on how to replace dialysis fluid. Mentioning the barriers to hygiene behaviors by the patients in the Fourth session (solo session).

Reviewing the tips taught in the previous two sessions, performing fluid exchange steps by the patient, and resolving problems.

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In this study, film screenings, educational booklets, and role plays were used in the training sessions. The questionnaires were distributed among the two groups before, immediately, and 2 months after a training session for the control group and three sessions of the intervention group.

### Inclusion criteria

Inclusion criteria include patients with no known hearing impairment and anxiety disorders and the passage of at least 3 months since the onset of patients' peritoneal dialysis.

### Exclusion criteria

Exclusion criteria include a patient underwent hemodialysis or kidney transplantation or missed one of the training sessions.

### Statistical analysis

Data were analyzed by SPSS software, version, 19 (IBM, Aromak, NY, USA) Chi-square, Mann-Whitney, and Fisher's exact test were used to compare the frequency distribution of background variables of the two groups [Table 1].

Repeated measures ANOVA were used to compare the means in each group at the three mentioned stages. Independent *t*-test was used to compare the means between the two groups [Tables 2 and 3]. The significance level was considered to be  $P < 0.05$ .

## Results

Sixty patients undergoing peritoneal dialysis with the specifications in Table 1 participated in the study.

There was no significant difference between background variables and knowledge levels in the two groups before the intervention, but immediately and 2 months after the intervention, the mean score of knowledge in the intervention group significantly and consistently increased compared to the control group. The mean scores of perceived sensitivity, severity of perceived threat, perceived benefits, and perceived self-efficacy were not significantly different between the two groups before the intervention, but immediately and 2 months after the intervention, the mean scores in the intervention group were significantly more than that in the control group ( $P < 0.05$ ). The difference between mean scores of perceived barriers before and immediately after the intervention was not significantly different in the two groups; however, it was significantly lower in the intervention group than in the control group 2 months after the intervention [Table 2].

With regard to preventive behaviors, there was no significant difference between the mean score of individual hygiene indices at any of the three times in the two groups. There was also no significant difference between the mean score of environmental hygiene indices before and immediately after the intervention in the two groups, but, 2 months after the intervention, it was significantly higher in the intervention group than the control group.

**Table 1: Comparison of background information of the two groups**

Variable	Mean±SD or n (%)		Statistical test	
	Intervention group	Control group	<i>t</i>	<i>P</i>
Age (years)	52.8±13	54.6±15.4	0.49	0.63
Duration of treatment with peritoneal dialysis (months)	25.1±5.1	29.8±4.3	0.71	0.48
Frequency of peritoneal infection	2.2±1.5	2.1±1.3	0.035	0.97
Variable	Frequency (%)	Frequency (%)	$\chi^2$	<i>P</i>
Gender				
Female	18 (60)	16 (53.3)	0.27	0.60
Male	12 (40)	14 (46.7)		
The cause of chronic renal failure				
Diabetes	6 (20)	4 (13.3)	2.60	0.46
Blood pressure	10 (33.3)	8 (26.7)		
Syndrome X	4 (13.4)	9 (30)		
Other causes	10 (33.3)	9 (30)		
Education				
Illiterate	6 (20)	8 (26.6)	Z=0.31	0.75
Below high school diploma	15 (50)	15 (50)		
High school diploma and associate degree	7 (23.3)	5 (16.7)		
Master's and higher	2 (7/6)	2 (6.7)		
Being employed	13 (43.3)	14 (46.6)	-	0.50
Training on the prevention of peritoneal infection and infection of the catheter exit site	28 (93.3)	30 (100)	-	0.25

SD=Standard deviation

**Table 2: Comparison of mean score of knowledge and the health belief model constructs in intervention and control groups in three stages**

Variable	Time	Mean±SD		Independent t-test	
		Intervention group	Control group		
Know ledge	Before intervention	63.75±24	62.17±27.20	0.24	0.81
	Immediately after intervention	98.33±5.43	84.58±26.40	2.79	0.009
	2 months after intervention	91.25±21.06	75.83±32.65	2.17	0.03
	Repeated measures ANOVA				
	<i>F</i>	40.50	7.12		0.02
	<i>P</i>	<0.001	0.003		
Perceived sensitivity	Before intervention	69.17±22.13	73.44±23.11	0.73	0.47
	Immediately after intervention	96.83±11.78	75.18±23	4.47	<0.001
	2 months after intervention	97.58±9.41	78.08±23.96	3.89	<0.001
	Repeated measures ANOVA				
	<i>F</i>	26.78	0.32		<0.001
	<i>P</i>	<0.001	0.73		
Intensity of perceived threat	Before intervention	78.50±20.60	77.76±20.47	0.14	0.89
	Immediately after intervention	97.67±10.96	79.96±20.25	4.79	<0.001
	2 months after intervention	98.28±5.05	75.58±21.32	5.30	<0.001
	Repeated measures ANOVA				
	<i>F</i>	14.97	0.91		<0.001
	<i>P</i>	<0.001	0.42		
Perceived benefits	Before intervention	81.50±22.33	83.62±15.52	0.42	0.67
	Immediately after intervention	98.33±9.13	85.18±18.83	3.35	<0.001
	2 months after intervention	98.62±4.98	81.28±16.91	4.95	<0.001
	Repeated measures ANOVA				
	<i>F</i>	10.2	0.93		<0.001
	<i>P</i>	<0.001	0.41		
Perceived barriers	Before intervention	51.97±29.11	50.86±31.24	0.14	0.89
	Immediately after intervention	40.92±27.89	51.34±30.59	1.36	0.18
	2 months after intervention	28.02±21.63	53.75±30.78	3.59	<0.001
	Repeated measures ANOVA				
	<i>F</i>	8.54	0.46		0.02
	<i>P</i>	0.001	0.63		
Self-efficacy	Before intervention	59.25±25.08	63.30±22.40	0.65	0.52
	Immediately after intervention	93.57±15.22	68.24±20.63	5.29	<0.001
	2 months after intervention	91.63±8.28	62.64±17.33	7.77	<0.001
	Repeated measures ANOVA				
	<i>F</i>	33.93	2.53		<0.001
	<i>P</i>	<0.001	0.10		

S=Standard deviation

Moreover, there was no difference between the score of hygiene indices related to dialysis fluid replacement technique before the intervention in the two groups, but it was significantly higher in the intervention group than in the control group immediately and 2 months after the intervention [Table 3].

## Discussion

The results of the evaluation of the effect of the HBM-based education on behaviors preventing peritonitis showed that this type of intervention, in addition to raising knowledge, increased the perceived threat of the complications resulted from ignoring hygiene behaviors, increased understanding of the benefits of these behaviors,

reduced perceived barriers, increased self-efficacy and thereby improving peritonitis preventive behaviors and had a 2-month persistence. The results of this study showed that lectures also increased the level of knowledge immediately after intervention; however, the effect was not persistent that was due to the high prevalence of amnesia among these patients. These results are consistent with those obtained by Khiyali *et al.* in 2017<sup>[14]</sup> and Boyd and Windsor in 2003.<sup>[15]</sup>

The findings of this research also showed that training in the intervention group was associated with an increase in perceived sensitivity, while training in the form of lecture did not have this effect. This means that patients in the intervention group deemed themselves prone to peritonitis

**Table 3: Comparison of the mean score of peritonitis preventive behaviors in groups at three times intervention and control**

Variable	Time	Mean±SD		Independent <i>t</i> -test	
		Intervention group	Control group	<i>t</i>	<i>P</i>
Personal hygiene	Before intervention	75.83±14.94	76.33±8.19	0.35	0.85
	Immediately after intervention	77.67±11.04	77.33±10.15	0.23	0.90
	2 months after intervention	79.48±2.79	76.50±8.19	1.49	0.14
	Repeated measures ANOVA				
	<i>F</i>	1.47	0.73		0.42
	<i>P</i>	0.22	0.49		
Environmental hygiene	Before intervention	90.13±14.72	92.25±9.10	0.67	0.51
	Immediately after intervention	95.45±12.42	94.51±1.79	0.41	0.68
	2 months after intervention	98.75±2.76	93.46±2.83	7.01	<0.001
	Repeated measures ANOVA				
	<i>F</i>	7.19	1.29		0.01
	<i>P</i>	0.003	0.29		
Dialysis-fluid replacement technique hygiene	Before intervention	70.76±9.47	73.65±6.12	1.39	0.17
	Immediately after intervention	80±4.31	74.74±3.47	5.09	<0.001
	2 months after intervention	79.74±3	73.74±4.33	6.03	<0.001
	Repeated measures ANOVA				
	<i>F</i>	20.83	1.56		<0.001
	<i>P</i>				

SD=Standard deviation

and understood that they are likely to develop it. Increased perceived sensitivity is one of the effective factors on the incidence of health-related behaviors. Increased perceived sensitivity is one of the effective factors on the incidence of health-related behaviors. Ahmadpoor *et al.* in 2015 showed that HBM-based educational program was effective on perceived sensitivity in pregnant women regarding nutritional behaviors.<sup>[16]</sup> The study of Baiden and Rajulton in 2011 aimed at investigating the factors affecting the use of condom in women using the HBM showed that this model increased the perceived sensitivity of women;<sup>[17]</sup> however, a study showed the perceived sensitivity of the intervention group to mammography did not show a significant difference after the intervention.<sup>[18]</sup> The intervention group believed in the unknown events of the future are based on fate and God's will, and changing traditional and deterministic beliefs requires long-term education.

The increase in the severity of perceived threat in the intervention group immediately and 2 months after the intervention was in line with the previous reports,<sup>[19,20]</sup> but contradicted the results of Ezzati *et al.* in 2017.<sup>[21]</sup> Their results showed that educational intervention had no effect on the increased severity of the perceived threat to cervical cancer screening behaviors. This contradiction in the effect of HBM-based education on patients undergoing peritoneal dialysis compared with healthy participants to promote screening behaviors suggests that increased level of perceived threat after education is likely to occur in patients more than healthy individuals. As a person's perception of the severity of a disease is effective on

adopting preventive behaviors, the greater the perceived severity of the threat, the greater the likelihood of adopting preventive behaviors.<sup>[22,23]</sup>

The present study showed that training patients based on the HBM are also effective in understanding the benefits of peritonitis preventive behaviors. A study showed that HBM-based education was effective on promoting the perceived benefits of diet adherence in pregnant women<sup>[24]</sup> and another showed also showed that HBM-based training could improve the score of perceived benefits of self-care behaviors in preventing diabetic foot.<sup>[25]</sup> Contrary to the results of this study, Torshizi *et al.* in 2009 reported that after training intervention that there was no significant difference between the two groups regarding perceived benefits of calcium intake and exercise.<sup>[26]</sup> However, the perceived benefits of calcium intake on bone density get revealed to individuals in the long run and there is no immediate, clear clinical evidence for these benefits in the short-term, while the complications of unhealthy/unsanitary behaviors in peritoneal dialysis patients are visible in the short-term through tangible symptoms that lead to peritonitis development. Accordingly, this can be effective in understanding the perceived benefits.

Based on the HBM theories, the increase in the level of perceived threat (sensitivity/severity) is accompanied by a reduction in perception of barriers. It was observed in the present study that when the perception of threats and benefits increased, the level of perceived barriers decreased. In Addition, the perceived barriers of the intervention group were significantly lower 2 months after the intervention

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than immediately after the intervention which can be, to a great extent, due to the experiences gained in this period through the training behaviors.

This result confirms that peritonitis preventive behaviors in peritoneal dialysis patients follow the HBM theories. This study showed that the HBM-based training led to a higher increase in the self-efficacy score in doing peritonitis preventive behaviors, as compared to lecture-based teaching. This research confirms the results obtained by some studies.<sup>[25,27]</sup> Self-efficacy is directly associated with the adoption of preventive behaviors, and a person with low self-efficacy is less inclined to change their habitual behaviors.<sup>[22,28]</sup>

Other finding of the research showed that HBM-based training not only increased the health belief of patients undergoing peritoneal dialysis but was also associated with the improvement of preventive behaviors.

### Limitations

Among the limitations of the study mention may be made of the completion of the questionnaires in three stages which could affect the evaluation of the results.

### Conclusions

Based on the active participation of the all participants of the study in the intervention group, training through HBM method has been interesting to attract the participation of the patients and can improve the health-related behaviors to peritonitis preventive in patients who undergoing peritoneal dialysis by promoting health belief constructs more than lecture-based education. Therefore, the design and implementation of HBM-based education programs for these patients are recommended.

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### Conflicts of interest

There are no conflicts of interest.

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