

## Research Paper

## Efficacy of Continuous Care Model Implementation on Body Mass Index and Lifestyle of Middle-aged Obese People



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**ABSTRACT**

**Background:** This study aimed to determine the effect of continuous care model application on body mass index and lifestyle of middle-aged obese people.

**Methods:** A total of 105 obese middle-aged people were selected and randomly assigned to two groups. The study data were collected using a meter, scale, and the Walker Health Promotion Lifestyle questionnaire (HPLP II). The participants completed the questionnaire before and one, two, and three months after the intervention

**Results:** There was no significant difference between the experimental and control groups before the intervention considering all studied variables. However, a significant difference was observed between groups after the intervention regarding lifestyle dimensions and obesity control performance.

**Conclusion:** Our study showed that the continuous care model could effectively improve the lifestyle and health of middle-aged obese people. Therefore, this model is recommended as a framework to design an overweight and obesity prevention plan.

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## 1. Introduction

**O**besity and overweight are undesirable in society [1]. The extent of overweight and obesity effects on health depends on their degree and the distribution of fat in the body [2]. The World Health Organization (WHO) has classified Body Mass Index (BMI) ranges of 20-25, 25-30, and >30 kg/m<sup>2</sup> as normal, overweight, and obese, respectively. Because of the prevalence of obesity in Iran and the world, focusing on this issue seems necessary [3]. According to WHO, 1.6 billion adults worldwide suffer from overweight, and the prevalence of overweight and obesity in Iran is 32% and 18.1%, respectively [4]. Obesity is associated with increased risk of lipid profile, blood pressure, atherosclerosis, type II diabetes mellitus, arthritis, depression, and breast and colon cancers [5-7]. In addition, a high correlation is observed between BMI and cardiovascular disorders [8, 9]. Also, a relationship has been reported between obesity and behavioral risk factors, as well as demographic and socioeconomic characteristics, such as dietary habits, gender, educational level, lactation to children, age, and history of obesity [10].

A lot of research has been done on obesity treatment methods. The main goal of the treatment is weight loss. The main benefit of weight loss is to correct or prevent cardiovascular risk factors [11]. The development of society requires active and healthy people. The issue of health depends on many factors such as lifestyle [12] that includes behaviors, such as eating habits, sleep and rest, physical activity and exercise, weight control, smoking and alcohol consumption, immunization against disease, adaptation to stress, and the ability to use family and community [13, 14]. People strive to choose a lifestyle to maintain their health and prevent illness.

Non-communicable diseases, especially obesity, have a close relationship with lifestyle. In other words, lifestyle is one of the important determinants of individual health [15]. Health promotion behavior is considered a significant factor in the health promotion concept and healthcare [16]. To change unsafe behaviors and promote health, nurses resort to interventions and various models as a performance guide. One of these models is the continuous care model, which is a systematic and continuous process to create an effective, intermittent, and consistent communication between the patient as a care taker and the nurse as the health care provider. This model aims to recognize the needs and problems, sensitize patients to accept and conduct ongoing health behaviors, maintain recovery and promote patients' health. In Iran, Ahmadi

in 2001 prepared a continuous care model concerning chronic coronary patients. This model has four stages: identification, sensitization, control, and evaluation. In Ahmadi's model, the patient is considered a continuing and effective care case in the health process [17].

Various studies have reported numerous positive effects of this model. For example, it improved the quality of life of schizophrenic [18] and hemodialysis patients [19] and decreased the re-admission and chest pain of patients with coronary artery disease [17]. The main goal of the continuous care model is developing programs that can result in the adoption and enhancement of insight and adequate performance to control the disease and its complications. The basic functions of this model include recognizing the illness and its nature, recognizing the actual and potential problems induced by the disease, accepting the disease and its effects on life, implementing the role of continuous self-control (good health behaviors), investing in maintaining and valuing health, engaging family for the management of current and immediate problems, changing the patterns and lifestyles, enhancing self-esteem, recognizing the care and treatment team and benefiting from them [20, 21]. The continuous care model establishes and maintains a dynamic, flexible, and continuous communication between the nurse and the patient to improve the patients' lifestyle [22].

With respect to the high prevalence of obesity and its adverse effects on the body, especially during middle age, nurses should identify and provide strategies for improving and promoting obese people's health and reducing obesity, and promoting their lifestyles based on some patterns. Therefore, this study aimed to determine the effect of the continuous care model on Body Mass Index (BMI) and lifestyle of obese middle-aged people at Gonabad University of Medical Sciences.

## 2. Methods

The present randomized clinical trial with a pretest-post-test design was performed on 105 obese middle-aged people referred to Gonabad healthcare centers during 2014-2015. The current study was approved by the Ethics Committee of Gonabad University of Medical Sciences (gmu.irec.1393.89) and was recorded in IRCT (Code: 2016070428790N1).

The sample size was estimated using the following formula (comparing the average of two independent communities) with a confidence interval of 99% and power of 80%. The basic parameters are inserted in the formula

based on the Ghavami et al. study [17], and 48 people were determined for each group, which increased to 53 people considering a 10% dropout.

Also, one person from the control group was excluded from the study due to unwillingness to continue cooperation (Figure 1).

$$n = \frac{(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2 (s_1^2 + s_2^2)}{\mu_1 - \mu_2} = \frac{11.70(172.59^2 + 142.45^2)}{(45.97^2 + 42.35^2)} \cong 48$$

To determine the BMI, we used the following Equation:

$$BMI = \text{Weight (kg)} / \text{Height}^2 (m^2)$$

Standard scales were used to measure participants' height and weight.

### Study instrument

The study questionnaire consisted of three sections: demographic characteristics, Walker Health Promotion Lifestyle dimensions (HPLP II), and obesity control performance. The HPLP II questionnaire is an appropriate localized tool for measuring health-promoting behaviors. It has 52 questions in 6 subscales (nutrition, physical activity, health responsibility, stress management, interpersonal relationships, and spiritual growth). The validity and reliability of the Persian version of this questionnaire were examined by Mohammadi Zeidi et al., who reported the Cronbach  $\alpha$  coefficients for the whole scale as 0.82 and the subcategories from 0.44 to 0.91 [19]. The questions are scored on a 4-point Likert scale (never, sometimes, often, and routinely). The minimum and maximum total scores are 52 and 208, respectively.

Also, a researcher-made questionnaire was designed to determine the performance of obesity control, to unravel one's performance toward observing the necessary principles for controlling obesity, and to assess the impact of continuous care model implementation. This questionnaire consisted of 40 questions in 4 dimensions: diagnosis and follow-up, correct nutrition, correct habits, and proper physical activity. It is ranked on a performance scale of Yes (1) and No (0). The total score of the questionnaire was obtained from sum of its subscales scores. The content validity of the questionnaire was obtained by preparing the questionnaire based on the continuous care model and considering reliable scientific sources. Then, the questionnaire was handed to 10 professors with sufficient expertise and experience. Finally, the questionnaire was revised with respect to their comments, and its validity was approved.

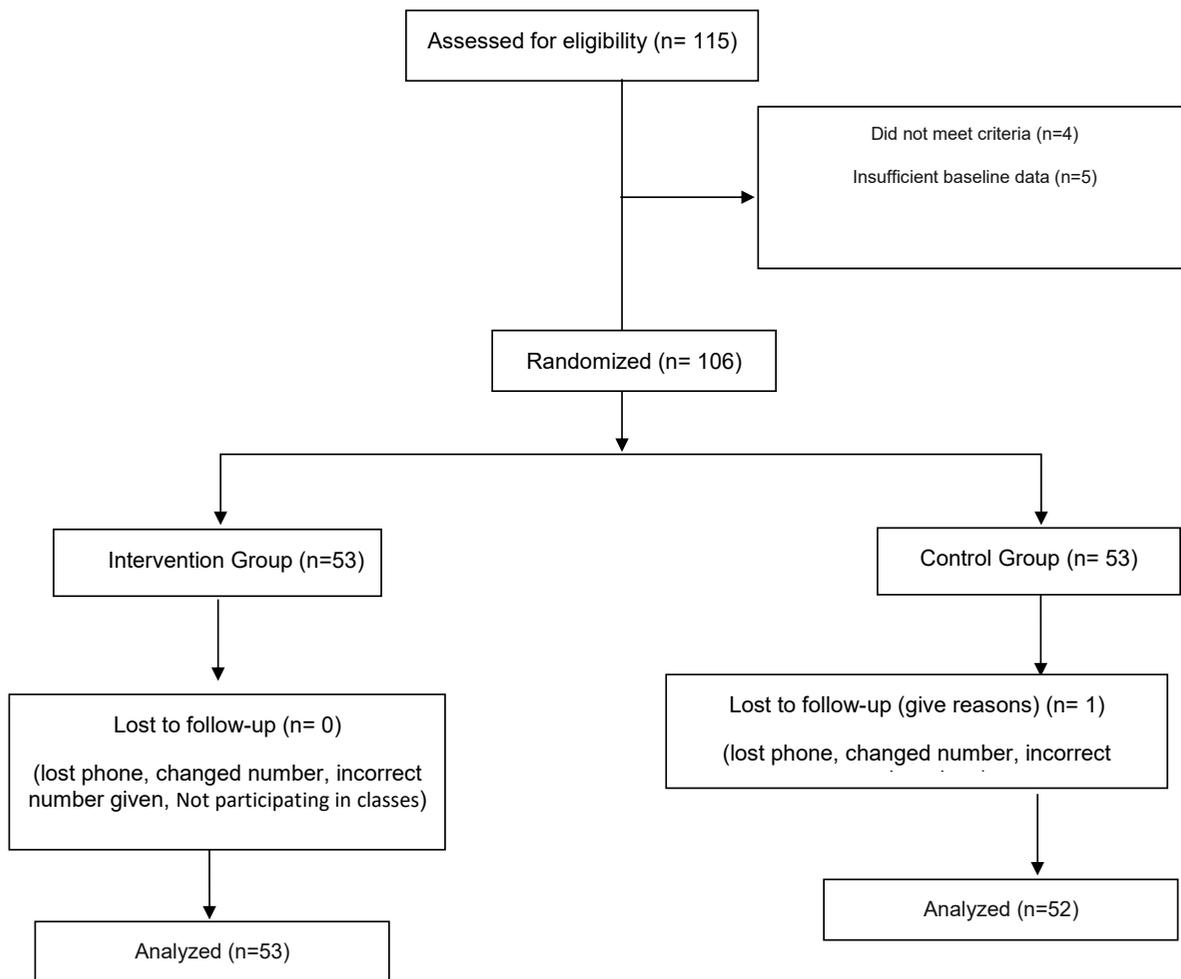
The reliability of the questionnaire was evaluated using the Coder-Richardson method. The internal consistency of the whole questionnaire was 0.78, of diagnosis and follow-up dimension 0.84, of proper nutrition 0.73, of correct habits 0.80, and of appropriate physical activity 0.75.

At first, the participants were selected among the individuals referred to Gonabad City healthcare centers, Iran using a convenience sampling method. Also, they must meet the following criteria: aged 41-60 years, with BMI higher than 30, not under a specific diet, no liver disease, kidney failure, high blood pressure, diabetes, and depression, not using lipid-lowering drugs during the previous 3 months, being literate, and able to take care of themselves. After obtaining their written consent, the participants entered the study. They were randomly assigned to two groups of control and experimental using the permuted-block randomization method.

The control group received routine care that contained oral training by a health center expert. However, the experimental group underwent a weight control program based on the continuous care model depicted in the following four steps:

**Identification:** The goal of this step is to identify the patient and the nurse and to explain all the steps of the model. This step consists of the introduction of the nurse to the patient, clarifying nurses' expectations at all stages of the study, identifying the patients' expectations, determining the preferred method of communication (face to face or phone calls), agreeing on appointment times, and clarifying the goals of the study. The identification step lasted for half an hour or one hour for each participant, during which BMI, lifestyle, and obesity control performance were preliminary reviewed.

**Sensitization:** This step involved examining the participant's status, clarifying the participant's educational needs, explaining obesity, obesity-induced complications (the present and possible ones), the necessity of considering obesity control regimes, studying basic needs concerning diet and physical activities, elucidating problems caused by lack of attention to weight control, illustrating weight loss patterns, the importance of care continuity behaviors in maintaining health and controlling its complications, addressing the intended questions and answers with emphasis on risk factors to help the patient understand the nature of obesity and its early and late complications and to involve the patient with obesity-induced complications. Depending on the participants' tolerance, comprehension, awareness, knowledge, and problems, 4 to 6 sessions were held, which



**Figure 1.** Consort of study design



lasted 1 to 2 hours in groups of 5 to 7. In addition, individual sessions were held to complete the discussions and help participants who were not present at the training sessions. The identification and sensitization steps were held during the first 3 weeks of each month, for 3 consecutive months.

**Control:** The goal of this stage was to institutionalize and sustain health-promoting behaviors by resorting to practices, such as weight control regimens, indirect evaluation of acquired skills, the sustainability of health behaviors examination, consideration of new needs with regard to new problems, and re-sensitization to solve the problems, health behaviors reinforcement and justification of intervention beneficial effects, signifying concrete indicator improvements, controlling the studied indicators, explaining the proposed solution by the participant, enhancing personal and telephone communications, gaining participants' trust, institutionalizing the continuity of behaviors, and controlling, removing, or adjusting obesity risk factor. At this

stage, continuous care consultations were performed weekly through face-to-face talking or phone calls tailored to the care needs of the experimental group. At the end of each month, BMI, lifestyle, and obesity control performance were evaluated in both groups.

**Evaluation:** Although the evaluation was the fourth and final step of the model, the BMI, lifestyle, and obesity control performance were evaluated in both groups at all stages. It should be noted that no intervention was done in the control group. The participants completed the questionnaires in the experimental and control groups before and one, two, and three months after the intervention.

The statistical analyses were performed at a 95% confidence level using the SPSS v. 20 software. The relationships between the dependent and independent variables were investigated using the paired and independent t tests, repeated measures Analysis of Variance (ANOVA) for continuous variables, and the Chi-square test for categorical variables.

**Table 1.** Demographic characteristics of the study participants

Variables	No. (%)		P	Statistical Test	
	Case Group	Control Group			
Gender	Female	29(54.70)	28(53.80)	0.93	$\chi^2$
	Male	24(45.30)	24(46.20)		
Marital status	Married	48(90.60)	46(88.50)	0.68	$\chi^2$
	Single	0(0)	1(1.90)		
	Death spouse	1(1.90)	2(3.80)		
	Divorced	4(7.50)	3(5.80)		
Education level	Illiterate	24(45.30)	24(46.20)	0.96	-
	Primary	13(24.50)	14(26.90)		
	High school	8(15.10)	8(15.40)		
	Diploma	8(15.10)	6(11.50)		
Employment	Unemployed	3(5.70)	4(7.70)	0.93	-
	Employed	5(9.40)	7(13.50)		
	Self-employed	6(11.30)	7(13.50)		
	Housewife	15(28.30)	13(25.0)		
	Retired	21(40.40)	24(45.30)		
Smoking	Yes	16(30.20)	14(0.26)	0.88	-
	No	37(69.80)	38(0.73)		



### 3. Results

The current investigation was conducted on 105 participants. The Mean $\pm$ SD age of the participants in the experimental group was 48.7 $\pm$ 5.37 years, and in the control group was 48.55 $\pm$ 5.59 years. The two groups were

homogenous in gender, marital status, education level, employment status, income, and smoking (Table 1).

The results of repeated measures ANOVA indicated no significant difference between the two groups regarding BMI (P=0.49, F=0.055) (Table 2).

**Table 2.** Comparing Mean $\pm$ SD of BMI in different stages of study between the two groups using independent t-test

Stages	BMI, Kg/m <sup>2</sup> (Mean $\pm$ SD)		Statistical Test	
	Case Group	Control Group	P	t
Before the intervention	35.97 $\pm$ 2.99	35.86 $\pm$ 3.23	0.84	0.19
One month after the intervention	35.80 $\pm$ 2.98	35.87 $\pm$ 3.22	0.91	0.11
Two months after the intervention	35.73 $\pm$ 3.07	35.83 $\pm$ 3.26	0.87	0.17
Three months after the intervention	35.68 $\pm$ 3.02	35.80 $\pm$ 3.24	0.84	0.20



**Table 3.** Comparing Mean±SD scores of health-promoting lifestyle dimensions in different stages of study between the two groups

Lifestyle Dimensions	Stages	Mean±SD		P
		Case	Control	
Spiritual growth	Before the intervention	17.11±4.10	18.08±3.58	0.20
	One month after the intervention	17.70±4.39	18.56±3.77	0.28
	Two months after the intervention	18.11±4.37	18.94±3.83	0.30
	Three months after the intervention	18.62±4.27	19.04±3.72	0.76
Health Responsibility	Before the intervention	17.21±3.63	17.46±4.15	0.74
	One month after the intervention	18.09±3.42	18.40±4.19	0.68
	Two months after the intervention	18.62±3.48	18.85±3.86	0.76
	Three months after the intervention	19.17±3.56	19.08±3.59	0.89
Interpersonal Relations	Before the intervention	18.66±3.98	17.63±4.19	0.20
	One month after the intervention	19.34±4.24	18.13±4.08	0.14
	Two months after the intervention	19.87±4.12	18.31±3.09	0.05
	Three months after the intervention	20.49±3.83	18.96±3.66	0.04
Stress management	Before the intervention	18.75±3.99	18.15±4.10	0.45
	One month after the intervention	20.60±4.64	18.90±4.02	0.04
	Two months after the intervention	21.02±4.56	19.33±3.94	0.04
	Three months after the intervention	21.47±4.16	19.65±3.77	0.02
Physical Activity	Before the intervention	17.47±4.24	18.21±4.41	0.38
	One month after the intervention	21.02±4.00	19.06±3.98	0.01
	Two months after the intervention	22.47±3.72	19.13±3.97	<0.001
	Three months after the intervention	23.34±2.89	19.42±3.91	<0.001
Nutrition	Before the intervention	15.53±3.41	15.75±3.75	0.75
	One month after the intervention	19.79±3.71	16.40±4.23	<0.001
	Two months after the intervention	20.92±3.63	16.65±4.33	<0.001
	Three months after the intervention	22.34±3.65	17.12±4.16	<0.001
Total	Before the intervention	104.74±9.60	105.29±10.60	0.78
	One month after the intervention	116.55±10.60	109.46±11.25	0.001
	Two months after the intervention	121.02±10.57	111.21±10.78	0.001
	Three months after the intervention	125.43±10.34	113.27±9.47	0.001



**Table 4.** Comparing Mean±SD dimensions of obesity control performance in different stages of study between the two groups

Aspect Control Function Obesity	Stages	Mean±SD		P	Test
		Case	Control		
Detection and follow-up	Before the intervention	2.34±0.99	2.27±1.06	0.78	The Mann-Whitney
	One month after the intervention	2.64±1.02	2.38±0.95	0.24	
	Two months after the intervention	2.92±1.01	2.37±1.01	0.75	
	Three months after the intervention	3.11±1.05	2.38±0.93	<0.001	
Nutrition	Before the intervention	17.08±3.80	16.75±3.99	0.67	Independent t-test
	One month after the intervention	18.45±2.99	17.08±3.53	0.03	
	Two months after the intervention	18.09±3.60	16.96±3.66	0.11	
	Three months after the intervention	18.74±3.27	16.88±3.67	0.08	
Physical Activity	Before the intervention	2.28±1.02	2.33±1.04	0.84	The Mann-Whitney
	One month after the intervention	2.64±1.05	2.33±1.00	0.12	
	Two months after the intervention	2.83±0.90	2.31±0.89	0.05	
	Three months after the intervention	2.87±0.90	2.44±0.82	0.01	
Correct habits	Before the intervention	2.43±1.02	2.35±1.008	0.67	The Mann-Whitney
	One month after the intervention	2.70±0.93	2.35±0.92	0.05	
	Two months after the intervention	2.87±0.83	2.46±0.77	0.006	
	Three months after the intervention	2.91±0.81	2.52±0.75	0.015	
Total	Before the intervention	24.13±3.54	23.69±4.64	0.59	Independent t-test
	One month after the intervention	26.43±3.11	24.13±3.99	0.001	
	Two months after the intervention	26.72±3.68	24.10±3.99	0.001	
	Three months after the intervention	27.62±3.50	24.23±3.96	<0.001	



The findings demonstrated no significant difference between the experimental and control groups before the intervention concerning the mean score of lifestyle dimensions. However, there was a significant difference between the two groups after the intervention in terms of interpersonal relationships, stress management, exercise, physical activity, and nutrition (post-test) ( $P<0.001$ ) in a way that the mean scores in the experimental group were higher than the control group. In general, the two groups were similar in terms of lifestyle mean scores before the intervention. However, the two groups differed significantly after the intervention, and the lifestyle improved in the experimental group (Table 3).

The results showed no significant difference between the experimental and control groups before the intervention regarding the mean score of obesity control performance. However, significant differences were observed between groups after the intervention (post-test) concerning all dimensions, including diagnosis and follow-up, nutritional performance, physical activity, and correct habits ( $P<0.001$ ), and the experimental group obtained higher scores. In other words, the intervention made two groups differed significantly considering obesity performance and improved this performance in the experimental group (Table 4).

## 4. Discussion

The continuous care model can result in care acceptance, comprehension enhancement, and appropriate performance through designing and developing programs. Consequently, it can be beneficial in controlling obesity and its possible complications [17]. The results indicated that interventions, such as education, care, and counseling, are effective in weight control performance. This model emphasized all factors affecting lifestyle (comprehension development, responsiveness, exercise, nutrition, stress management, and interpersonal relationships), focused on the susceptibility process, and caused person engagement in self-care. The intervention significantly increased the total score of lifestyle and its dimensions, i.e., interpersonal relationships, stress management, exercise, physical activity, and nutrition in the experimental group, leading to participants' lifestyle promotion.

Rahimi et al.'s results were in line with our results [20]. Similarly, Sadeghi Sherme et al. showed that implementing the continuous care model improves the quality of life in patients who underwent coronary artery bypass graft [23]. Anjomanian indicated merely a statistically significant difference between two groups concerning interpersonal relationships using a continuous care model that is consistent with the results of this study [18]. In this care model, attention is paid to planning for physical activity and physical mobility. This is one of the reasons for the weight adjustment resulting from implementing the physical mobility program. People with high BMI suffer from obesity and being overweight because of impulsivity [24]. Consistent with other studies, the present research unraveled the significant role of intervention in improving nutritional performance and enhancing correct habits, physical activity, and obesity control performance. This intervention can be considered an essential factor in reducing complications and improving symptoms of health problems along with other treatments [20, 25]. Investigating the effect of the continuous care model on blood pressure and weight control in hemodialysis patients, Rahimi demonstrated that a proper exercise program could be effective in terms of weight loss [20].

In the same way, the study above showed that by improving physical activity, abandoning incorrect lifestyle habits, and enhancing lifestyle, overweight individuals could reduce their weight and benefit from its positive consequences, including improvements in blood sugar, lipids, and blood pressure control [26]. In addition, the current study results showed that the continuous care model had no significant effect on BMI that is in line with Rahimi et al., revealing no significant role for this

model concerning BMI in hemodialysis patients [20]. However, the findings were not consistent with those reported by Ely et al., Alizadeh et al., and Ghavami et al., which can be due to inadequate supervision for these activities implementation in the present study [17, 26, 27].

## 5. Conclusion

This study showed that the implementation of a continuous care model using a continuous approach could be an effective and applicable nursing intervention for improving the lifestyle of obese people. Implementing this model can benefit from controlling obesity since there is effective communication between the patient and the nurse. Therefore, this care model is suggested along with other usual care methods for obese middle-aged people. Sufficient evidence shows that implementing a continuous care model can significantly affect various lifestyle domains in obese patients. Concerning limitations, this research suffered from its cross-sectional design and the instruments for data collection, namely, questionnaire and self-question methods, since participants could refrain from providing honest responses. Moreover, the large number of questions prolonged the duration of completing the questionnaire, which could reduce the accuracy of the answers. Besides, this study was carried out on middle-aged people, so the findings cannot be generalized to other age groups.

## Ethical Considerations

### Compliance with ethical guidelines

This study was approved by the Ethics Committee of the Gonabad University of Medical Sciences (Code: IR.GMU.REC.1394.3).

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### Authors' contributions

Study design: Mitra Tavakolizadeh, Mahdi Moshki, and Ali Delshad; Manuscript preparation and data collection: Mitra Tavakolizadeh; Statistical analysis: Mahdi Basiri Moghadam; Manuscript review: All authors.

## Conflict of interest

The authors declared no conflict of interest.

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