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ORIGINAL RESEARCH

# The Experience of Pregnant Women in the Health Management Model of Internet-Based Centering Pregnancy: A Qualitative Study

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**Background:** CenteringPregnancy Care is a promising group prenatal care innovation that combines assessment, education, and peer support. In China, it is not clear how best to integrate the CenteringPregnancy Care into existing maternal health care models. This qualitative study aimed to explore Chinese pregnant women's experience in the Internet-based CenteringPregnancy management model.

**Methods:** The Internet-based CenteringPregnancy was applied in a tertiary hospital between 2018 and 2019 in Wuhan, Hubei Province. Through purposive sampling, a total of 9 pregnant women who had experienced Internet-based CenteringPregnancy were recruited. A semi-structured interview was used to collect qualitative data, and Colaizzi's 7-step method of phenomenological data analysis was used to analyze the collected data.

**Results:** Three themes were extracted from the participants' interviews, including: 1) empowerment; 2) psychological and social support; 3) challenges of the Internet-based CenteringPregnancy. The Internet-based CenteringPregnancy management model retained advantages of CenteringPregnancy, emphasizing the pregnant woman as the subject of health care and promoting them to participate in health care. Participants believed that they could exchange pregnancy knowledge, help each other, and improve mood both timely and efficiently from the new model. However, it was found that there were challenges in seminar time arrangement, topic selection, and discussion management.

**Conclusion:** The Internet-based CenteringPregnancy management model positively affected pregnant women's empowerment, psychological, and social support. It is recommended to improve the seminar's design in future studies.

**Keywords:** CenteringPregnancy, mobile health, health management, prenatal care

## Background

Childbirth and pregnancy are both a natural physiological phenomenon. During these stages, pregnant women face physical and psychological changes, which cause many health needs.[1] Studies have shown that pregnant women have different health needs, such as nutritional management, drug and vaccine use, weight management, physiological changes, sexual behavior, delivery methods, neonatal care.[1–5] Therefore, it is important that pregnant women get timely and accurate information about care and treatment options during pregnancy.[6]

Currently, the antenatal health care mode includes universal prenatal health management model, low-risk prenatal health management model, enhanced prenatal health management model, and high-risk prenatal health management

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model.[7] The Chinese prenatal health management model predominantly adopts the universal prenatal health management model, which shows the care is provided based on a medical model (ie obstetric-led prenatal care).[8] However, most women spend very little time with their obstetric providers during pregnancy. Thus, the social and psychological support for women during pregnancy was very poor, lacking a systematic management method.[9] Due to the disconnection between health education during pregnancy and examinations, the concept of making pregnant women the center was ignored, which made it difficult to meet the diversified and personalized needs of pregnant women. This resulted in a low utilization rate of health care during pregnancy.[1] Group prenatal care has emerged as a new way to provide prenatal care, which helps to meet multiple needs of pregnant women.[10] The most widely known model of group prenatal care is the CenteringPregnancy model,[9] which has been currently available at many countries throughout the world,[11] such as the United States, United Kingdom, Australia, Canada, Iran and Nigeria.

In the 1990s, Sharon Schindler Rising developed a new antenatal examination mode which through evaluation, education, and providing support for pregnant woman, helps to improve pregnancy outcomes.[12] In CenteringPregnancy, a group of 8–12 pregnant women of similar gestational weeks can participate in a seminar with their families every 2–4 weeks. They participate in self-assessment, which includes measurement of blood pressure and weight. An obstetrician, a certified nurse-midwife/certified midwife, or nurse practitioner, skilled in the group process, provide other professional prenatal examinations.[12] Studies have shown that the CenteringPregnancy model uses group health education, peer discussion, and antenatal examination of pregnant women to effectively provide adequate knowledge of nutrition, fetal monitoring, needs during labor, and neonatal care,[13,14] improve pregnant women's health awareness, satisfaction with medical treatment, and reduce the incidence of adverse pregnancy outcomes.[9,15] It has gradually become the most concerned prenatal care model in the world due to its efficiency and effectiveness. It has attracted more attention due to the vital needs to improve prenatal care outcomes.[9,10,16] The effectiveness of the CenteringPregnancy model in China was significant. It improved adverse pregnancy outcomes,[17,18] reduced postpartum anxiety and depression, and increased the rate of natural delivery and satisfaction in pregnant women.[19] The potential of digital technology to deliver healthcare services has been increasingly recognized worldwide.[20] An increasing number of "Internet-based medical services" are being utilized as they can reduce the time and space limitations and better optimize medical resources. Studies have shown the Internet was a common pathway for accessing prenatal care-related sources among Chinese pregnant women,[21,22] as well as in the western countries.[23] It is still unclear whether the Internet can be used for CenteringPregnancy. We combined the Internet with the CenteringPregnancy model to construct a new model, the Internet-based CenteringPregnancy management model. The purpose of this study was to explore the participants' experience of the Internet-based CenteringPregnancy management model, which would improve the prenatal care management model in China and in countries with similar healthcare systems and demographics as China.

# Methods

## Study Design

We used an interpretative phenomenological research method to explore the participants' experience of the Internet-based CenteringPregnancy management model. A semi-structured interview was used to collect qualitative data and Colaizzi's 7-step method of phenomenological data analysis was used to analyze the data.[24]

## Participants

Using purposive sampling, participants were recruited from a sample consisting of 12 pregnant women who had experienced Internet-based CenteringPregnancy during prenatal examination in a tertiary hospital in Wuhan, Hubei Province. The recruitment continued until data saturation was reached. We interpreted the data as saturated when no new themes emerged.[25] Inclusion criteria included: (1) pregnancy at less than 16 weeks gestation, singleton pregnancy, and no gestational complications (such as gestational diabetes, etc.); (2) took part in online discussions and offline seminars of Internet-based CenteringPregnancy during the prenatal period. Exclusion criteria included: participating in offline seminars less than twice in total. Informed consent was obtained from all participants. The participants informed consent included publication of anonymized responses. Our study complied with the Declaration of Helsinki. The study was approved by the Ethics Committee of Medical School of Wuhan University, China (2018jk002).

## The Implementation Process of Internet-Based CenteringPregnancy

Our team designed the Internet-based CenteringPregnancy based on the CenteringPregnancy model. The designer has been working in maternal care for 10 years and has extensive experience. Internet-based CenteringPregnancy includes three parts: online discussion in WeChat group, regular offline seminars, and WeChat public account. The topics of seminars and WeChat public accounts were outlined in Figure 1.

## Online Discussion in WeChat Group

Pregnant women could freely converse in the WeChat group, including asking questions to other pregnant women or researchers, as well as sharing their experiences and feelings during pregnancy. Time and topic were not limited. When the discussion got stalled due to the limitations of thinking or knowledge, researchers in the WeChat group guided the discussion and solved the problems that the participants could not solve on their own. For example, when a pregnant woman did not understand a biochemical indicator in a prenatal check, the researcher would explain it.

## Regular Seminars

The specific times and topics of the regular seminars were discussed prior to the study with participants and were determined according to their health needs and time schedules. The midwives or nurses made a brief introduction to the theme of the seminar before the formal start of the seminar so that the pregnant women could better understand and be prepared to have a successful discussion. The pregnant women discussed their problems around the theme of the seminar and together in a group resolved them.

## Method for Data Collection

Nine pregnant women who participated in the online discussion and offline seminars of Internet-based CenteringPregnancy were interviewed. Data was collected from October 2019 to November 2019. Before the interview, the interviewees were assured that the results of the interview would not affect the quality of their future perinatal care. After getting the participants' written informed consent, we collected a general demographic questionnaire of pregnant women which included age, monthly family income, educational background, gravidity, and parity. All interviews were conducted by the same trained researcher. The semi-structured interviews were audio-recorded and techniques such as repetition, summarization, silence, were used appropriately. Interviewees' non-verbal behaviors were also recorded. Each interview lasted an average of 30–40 minutes. After the ninth interview, no new data was identified, terminating the data collection.

After consulting with experts and reading the literature, a preliminary interview outline was developed. Two participants were pre-interviewed, and the interview outline was modified according to the results. The interview guideline was attached in the Supplementary File. During the interview, we asked participants to describe their

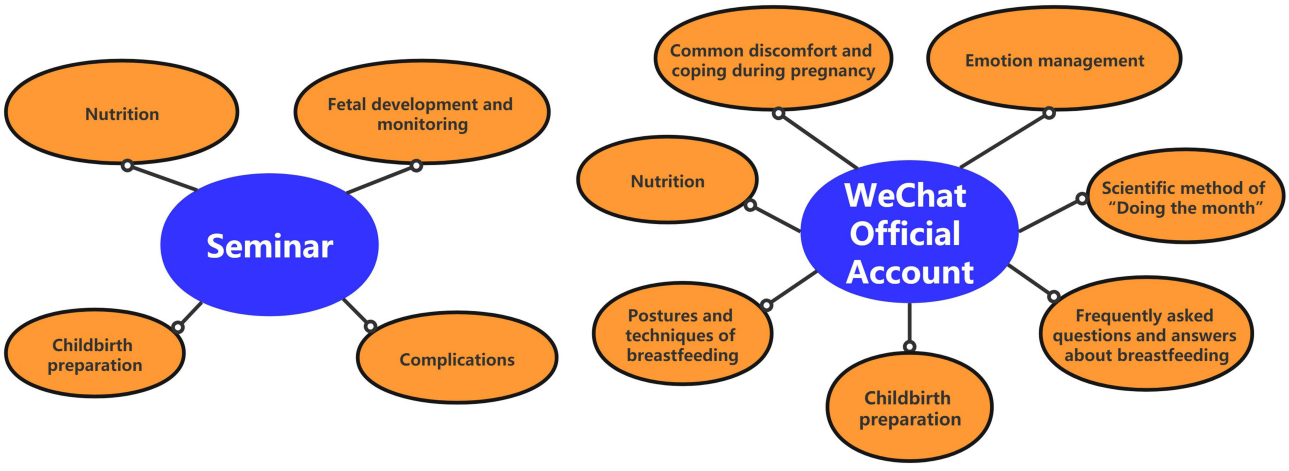


**Figure 1** The topics of seminars and WeChat public account.

experiences and feelings after participating in Internet-based CenteringPregnancy. We used special known terms to represent each participant (eg Pregnant woman, 27 years) to protect the privacy of participants.

## Data Analysis

Within 24 hours after the interview, the audio recording was transcribed independently by two researchers using computer software (Luyinla),[26] and the two transcripts were checked in combination with the interview notes to avoid errors. During the transcription process, the transcribers made notes on the interviewees' modal words, pauses, and other details. Transcripts were uploaded to NVIVO (QSR International Pty Ltd. Version 10, 2014) software to manage the data. The raw data and transcripts produced during the interviews were in Chinese. The transcriptions were translated first into English by one researcher and then back into Chinese by another researcher, both with a PhD degree in the field of medicine. The two versions of the statement were compared until all researchers confirmed that the original meaning had been accurately retained and the results were unambiguous.

The Colaizzi's 7-step phenomenological data analysis method was used to analyze the collected data.[24] We followed a strict Colaizzi's 7-step process, fully familiarizing the material, identifying significant statements, formulating units of meaning, clustering themes, developing an exhaustive description, producing the fundamental structure, and seeking verification of the fundamental structure. We read and compared the transcribed text repeatedly, focused on the interviewees' experiences and the meaning behind them. We identified the relevant content, encoded, compared the codes, and summarized it into different categories. Using the crowd-sourcing method, we extracted the themes and summarized them. Finally, the original data and the extracted themes were passed to the experts of the research team for checking and sorting, and then sent to the participants to verify whether the data matched their expressed wishes, to enhance the credibility of the results.

# Results

After inclusion and exclusion criteria were considered, nine participants were finally included in the study. The average age of the 9 pregnant women was 28.71 (SD±1.49, range 26–30 years). Other characteristics of these participants were shown in Table 1. We extracted three themes from participants' interviewed contents, see Figure 2.

## Empowerment

The Participants believed that participating in online and offline discussions would allow them to learn and exchange pregnancy knowledge to help each other. When there were questions that no partner can answer, the participants said they will take the initiative to ask the researchers and receive prompt and patient answers.

**Table 1** Characteristics of 9 Participants

| Characteristics | Total Sample |
|---|---|
| Educational background | |
| Bachelor's degree | 6 |
| Junior college degree | 3 |
| Monthly family income | |
| 3000–4999 yuan/month | 1 |
| 5000–9999 yuan/month | 3 |
| ≥ 10,000 yuan/month | 5 |
| Gravidity | |
| 1 | 6 |
| 2 | 3 |
| Parity | |
| Primiparous | 8 |
| Multiparous | 1 |

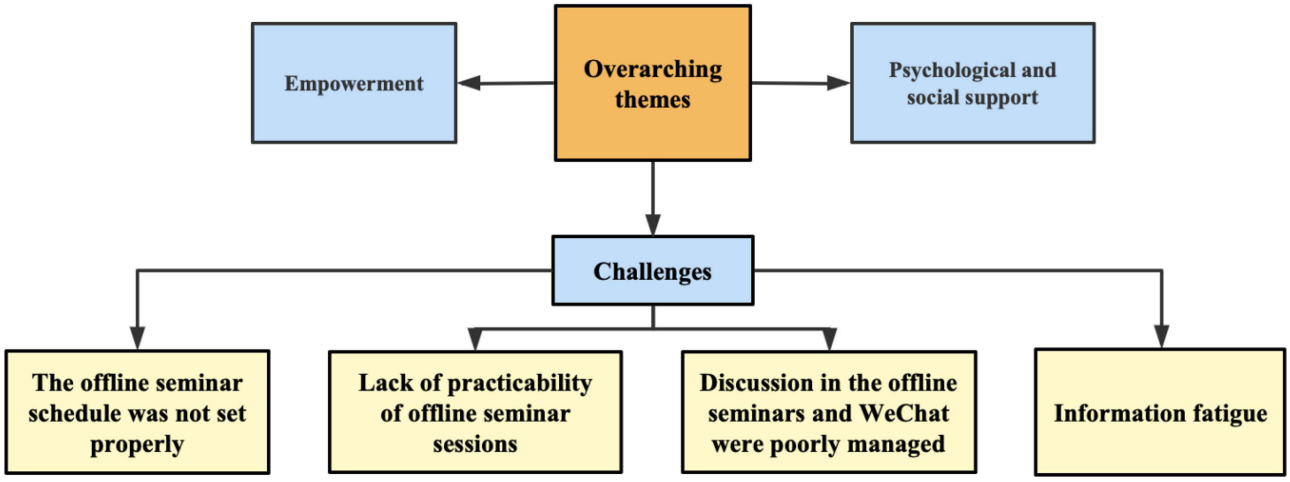


**Figure 2** Overarching themes.

(We) could discuss pregnancy knowledge together. If you did not understand relevant information, you could ask the teacher (researcher) and discuss with other pregnant women. We have learned a lot, and I believe that I would be a good mother. (Pregnant woman, 28 years)

Some participants expressed confidence to be a good mother because they mastered the practical skills such as nutritional management and baby care.

The model was pretty good. It had online discussion and, offline seminars, which meet individual needs …. Eh, from the online discussion and offline seminars, I learned how to keep nutrition balanced, how to take care of my baby when she is coming. I am confident to be a mother. (Pregnant woman, 30 years)

## Psychological and Social Support

Most participants had a high evaluation of the new management model, believing that they could gain knowledge, experience, and comfort from their partners during the discussion, which could not only learn and communicate pregnant health knowledge better, but also improve their mood.

In the prenatal exam, everyone would encounter a lot of problems, and then we could discuss and comfort each other in the group. (Pregnant woman, 26 years)

Everyone in the group had the same gestational week, so we could discuss similar problems together … and this could help to improve your mood during pregnancy. (Pregnant woman, 28 years)

## Challenges of the Internet-Based CenteringPregnancy

### The Offline Seminar Schedule Was Not Set Properly

Most participants pointed out that offline seminar schedules tend to conflict with their own lives. For example, everyone's spare time may not be the same, so the time the researchers set for the seminar did not match everyone's free time. Some participants said that they had planned to attend the offline seminar, but something happened suddenly, so they had to change their plan and could not go to the offline seminar.

I'd love to go (to the offline seminar), but because I was busy on weekends, sometimes missed … because the seminar schedules conflicted with my own time. (Pregnant woman, 29 years)

### Lack of Practicability of Offline Seminar Sessions

The participants expressed the offline seminar topics may be a little general and not detailed enough, the knowledge introduced is too professional and theoretical. They suggested that the topics should be more practical.

Too much professional knowledge I did not want to know. I want to know something more practical about my daily life … I think some knowledge was too theoretical. I want to know how to solve a problem about pregnancy when I have it. (Pregnant woman, 28 years)

### Discussion in the Offline Seminars and WeChat Were Poorly Managed

Although most participants could learn from the offline seminars and discuss freely in the WeChat from the Internet, some participants thought the discussion in the offline seminars and WeChat need to be managed better by the researcher. For example, researchers should correct the discussion direction if the content strays from the topic.

I know everyone could discuss, however, sometimes someone talked about other things, which I did not want to know. At that time, your research team should come to manage it by asking them not to discuss that topic. It influenced others in this group. (Pregnant woman, 26 years)

### Information Fatigue

The Participants expressed that the information in the WeChat group was too much and confusing. Some participants felt fatigued to find useful information from beginning to end. They said the researchers should collate and summarize useful information and send it at fixed time points.

Sometimes When I opened my WeChat, there was so much information in our WeChat group. I did not have time to read all of them, but I was afraid that I would miss some useful information. So, if you could summarize some useful information at the end of each discussion and send it to us. I think it would be helpful. (Pregnant woman, 30 years)

## Discussion

The Internet-based CenteringPregnancy elicited a range of advantages among pregnant women. The results of the interview showed that pregnant women could obtain the knowledge needed for pregnancy through online discussions and offline seminars, thus empowering the women. It also could improve health literacy and meet their health needs, which was consistent with the other study.[27] Respondents believed that the new prenatal management model enabled them to gain the knowledge and experience they needed, such as the meaning of pregnancy test results and nutrition management.[28,29] When the participants had a problem, and their family, friends, and peers in the group could not answer, they could also ask nurses or midwives to get reliable and accurate information. In the traditional model of prenatal examination, obstetrician doctors and nurses and ultrasound doctors may have time constraints or other factors that could not always give them enough time to answer the questions and meet the needs of pregnant women. The doctors also may not be familiar with the pregnant women due to prenatal examination doctors being different every time. They also may not provide personalized solutions and support for each pregnant woman.[29,30] The offline group discussions also provided participants with a platform for face-to-face consultation, discussion, and sharing.[29]

The participants believed that the new pregnancy management model provided them with opportunities to learn, communicate about their experiences, and discuss, from which they could obtain the required assistance to meet their own needs.[27] CenteringPregnancy model could also help participants establish social networks and provide pregnant women with social support,[31] which was like the results of our study. Most participants also reported that participating in online discussions and offline seminars helped them improve their mood as well as gain empathy and psychological support from their peers. In the new model, participants shared their questions and worries with peers. Listening to other people's questions and communicating with each other in the discussion to solve the problems increased their sense of belonging, helped them to build a new social network and emotional support system,[32] and reduced their isolation and anxiety during pregnancy.[30,33]

The Internet-based CenteringPregnancy was generally satisfactory to the participants but there were some challenges in developing the model. Currently, there are few studies focused on the factors influencing participants' attendance at CenteringPregnancy seminars.[34] In this Internet-based CenteringPregnancy, most interviewees believed that the schedule and timing of the offline seminar was the main factor behind whether they attended or not. This relates to one of the obstacles encountered in the current study as each participant had their own schedule so it was difficult to arrange a time where everyone could attend the seminar.[28] In our study, the seminar was scheduled after the time of prenatal examination, which in theory saved time for pregnant women. Nevertheless, in practice, pregnant women still found that the offline seminar clashed with their personal schedules. Therefore, it was a big challenge to find a suitable time for everyone to participate. In the context of the times following COVID-19, we believe that increasing the number of online discussions and reducing the number of offline seminars could potentially be a good solution to the problem.

The participants also mentioned other factors that affected their participation. Some participants believed that the authority and experience of the experts invited to help host the offline seminar would influence their decision. Therefore, Internet-based CenteringPregnancy should frequently invite experts who had rich experience to assist the team in hosting seminars. Before the offline seminar start, the resume and experience of the invited experts and the number of participants who plan to go should be released to pregnant women in detail through a group of WeChat, which may improve the participation rate of offline seminars.

In Internet-based CenteringPregnancy, the topics of each seminar were proposed by the participants, but there were some challenges encountered while gathering consensus from the participants about offline seminar topics. "Whatever", "everything goes", and "I don't know what I need" were the most common responses when collecting opinions on the seminar. This indicates that the pregnant women were not clear about their own needs and that there are knowledge deficits as only a small number of pregnant women were able to come up with specific needs and ideas when the research team collected the offline seminar topics. To identify topics efficiently, we can retrospectively analyze some important topics by reviewing the literature and combining it with clinical experience in obstetrics. This could narrow down the range and help pregnant women to make choices. In addition, online discussion topics should be regularly posted in the WeChat group to guide the to ask questions, express their feelings and communicate their views around the topic. If the online discussion deviates significantly from the topic, promptly remind them to return to the topic. At the end of each online discussion, summarize useful information and send it to pregnant women in the group announcement to prevent them from missing important information.

At the beginning of the seminar, researchers gave a brief introduction of the discussion topic, so that the participants could understand the topic better and share their own experiences and feelings in the topic. However, some interviewees thought health education content was relatively broad and theoretical. From the research team's perspective, the health education's purpose was to introduce the seminar topic so that participants could have a general understanding of the topic and facilitate the subsequent discussion. Nonetheless, in the offline seminar, participants paid too much attention to the introduction of the topic and lacked enthusiasm in the discussion part.

Although there are some problems in the virtual CenteringPregnancy model, it also has some unintended benefits. Compared with traditional care models, relationships among patients that develop in the Internet group enhance pregnant women's social support levels, which may help women cope with their stress levels.[9,28,35] For pregnant women with disabilities which is one of the most vulnerable pregnant individuals, the Internet-based CenteringPregnancy model can provide more comprehensive support especially when they are in trouble at home. The speed of information transmission on the Internet allows for timely resolution of pregnant women's problems, but there is also a risk that, due to untimely management by researchers, pregnant women may obtain the wrong information and take the wrong advice on the Internet group, which may affect the pregnancy outcome. Moreover, there are still problems with network coverage in some areas, so the network accessibility needs to be improved and the cost of Internet communication needs to be further reduced to promote the development of Internet-based medical services.

The strength of our study is that it was the first study to explore the pregnant women's experience in the Internet-based CenteringPregnancy model, contributing to the qualitative literature and showing the potential benefits of Internet technology in group maternal health care. Studies have shown that the CenteringPregnancy model could improve the accessibility and quality of pregnancy care services, and health outcomes in disadvantaged areas.[36,37] Thus, the Internet-based CenteringPregnancy may provide a new solution to the problem of health care services during pregnancy in underprivileged and under-resourced areas. The policymakers are suggested to incorporate the Internet-based CenteringPregnancy model into routine prenatal care through the combination of offline group care and online medical services provided by the hospital's official WeChat.

There are several limitations in the current study. First, at the time of the interview, we did not know the outcome of the newborn after the birth or the maternal postpartum outcomes. A follow-up study to explore the long-term effects of the Internet-based CenteringPregnancy model on the outcomes of mother and child is needed. Second, we only explored pregnant women's experiences in one Wuhan hospital. Thus, the representativeness of the study was limited.

## Conclusions

The Internet-based CenteringPregnancy retains the advantages of CenteringPregnancy: empowerment and psychological and social support for pregnant women. At the same time, it uses the Internet for more timely communication and improved flexibility. The process of implementation of the Internet-based CenteringPregnancy management model also encountered

many difficulties, including time arrangement, topic selection, and discussion management, which showed the need for us to improve in the next step of the design. The Internet-based CenteringPregnancy provided a strategy for optimizing prenatal care models in China. Further research is needed on how to adapt the Internet-based CenteringPregnancy to different regional healthcare settings, increasing the coverage and quality of health care during pregnancy.

## Data Sharing Statement

Research data can be made available to interested parties upon reasonable request to the corresponding author.

## Ethics Approval and Informed Consent

Informed consent was obtained from all participants. The study was approved by the Ethics Committee of Medical School of Wuhan University, China (2018jk002).

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors have no conflicts of interest to declare relevant to this study's content.

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