Exploring challenges to nutrition intervention adherence using COM-B model among patients with wet age-related macular degeneration: a qualitative study

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ABSTRACT

Objectives To explore challenges to nutrition intervention adherence using the Capability, Opportunity and Motivation-Behaviour (COM-B) model among wet age-related macular degeneration (AMD) patients. These factors should be considered in the development of potential support and intervention programmes to address these problems.

Design A qualitative study was conducted with one-to-one and face-to-face interviews with wet AMD patients using a semi-structured question guide. Data were analysed based on COM-B model: capability (physical and psychological), opportunity (physical and social) and motivation (reflective and automatic).

Setting Southwest Hospital of Chongqing Province in China.

Participants A convenient and purposive sample of 24 wet AMD patients were recruited.

Results The themes and subthemes were identified: psychological capability: (1) insufficient knowledge of nutrition; (2) misconceptions about the disease and treatment; (3) knowledge conflict; physical capability: (1) physical restriction; (2) limited access to nutrition knowledge; physical opportunity: (1) communication between providers and patients; (2) health insurance and extra charges; (3) food environment; social opportunity: (1) stigma of disease; (2) family influence; reflective motivation: (1) self-efficacy; (2) attitude; (3) outcome expectancies; (4) lack of professional support; automatic motivation: (1) difficulties in changing eating habits; (2) mindset.

Conclusion Medical staff should pay much attention to the process of patients’ nutrition intervention. In addition, it is also necessary to develop professional and internet-based intervention to modify the dietary behaviour and improve the management skills of the patients.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The qualitative design was used to obtain patient-oriented understanding of the nutritional challenges and to exploit the potential support or programme in solving these problems among wet age-related macular degeneration (AMD).

⇒ The study highlighted the importance of promoting dietary behaviours and improving dietary management skills of the patients.

⇒ The sample was non-generalisation for all the areas in China, and dry AMD cases should be included in the future.

Age-related macular degeneration (AMD) is a chronic eye disease that affects the central area of the retina and causes blindness in both developed and low-income and middle-income countries. Among the Chinese population, the prevalence of AMD in individuals older than 50 years is 5.6%; as the population ages, this number will increase.1 AMD affects the patients' daily life functions such as reading and walking, which may lead to anxiety, depression and social dysfunction, thus seriously decreasing their quality of life.2 3 Late AMD can be classified into wet (neovascular) and dry (atrophic) forms. The wet form accounts for approximately 90% of AMD cases with severe vision loss.4 Although intravitreal injection of antivascular endothelial growth factor as the main treatment can prevent or slow down the progression of wet AMD,5 6 65% of wet AMD patients reported that they did not achieve significant improvement in visual acuity after the treatment.7 Recently, antioxidant supplementation has been reported to prevent and slow down the development of AMD.8 9 In the Age-Related Eye Disease Study 2, 25% of AMD patients in the moderate stage took antioxidant vitamins (eg, vitamin C, vitamin E), lutein, zeaxanthin and high doses of zinc and copper. They showed a reduction in progression to more advanced AMD within 5 years.10 Subsequently,
a large number of guidelines suggested that antioxidant vitamins and mineral supplements should be administered to AMD patients in the middle or late stage.\textsuperscript{11–14} Furthermore, dietary modification has been presented as one of the few means that can prevent AMD development and slow down its progression.\textsuperscript{15,16} For example, the Mediterranean diet, a typical diet in many European countries, mainly consists of cereals, grains, vegetables, beans, fruits and nuts; moderate amounts of fish, cheese, olive oil and wine; and little red meat.\textsuperscript{17} Greater adherence to the Mediterranean diet is associated with slower progression of AMD.\textsuperscript{18} It was also reported that a diet abundant in green vegetables, fish and omega-3-rich oil and supplemented by physical exercise is beneficial for patients with AMD, as it might delay disease progression and help retain better visual function.\textsuperscript{19} Regardless of their disease severity, AMD patients should be provided with dietary advice to increase their consumption of dark-green leafy vegetables, follow a low-glycaemic index diet and consume fish at least two times a week.\textsuperscript{16,20} Therefore, nutrition intervention, including dietary modification and antioxidant supplementation, has become a key modifiable factor to reduce the incidence of AMD and the most available method to preventatively treat the disease.\textsuperscript{21,22}

However, a large gap has been found between the evidence and the clinical practice. A study on the consumption of vegetable and fruit intake in older adults showed that the cohort consumed well below the recommended five-per-day quota.\textsuperscript{23} Although over 75\% of participants took nutritional supplements, the majority of them were not taking the proper dose.\textsuperscript{24} Furthermore, a cross-sectional case–control study was conducted to investigate the relationship between the blood levels of multiple fatty acids and antioxidants (carotenoids), dietary habits and AMD in the Asian population. It showed that the wet AMD group consumed significantly less omega-3-rich food (vegetables, seafood, nuts) and more meat than the age-matched normal control group in Hong Kong.\textsuperscript{25} This result is largely due to the following reasons. First, the existing guidelines are neither clear nor easy to practice. Second, patients misunderstand the relationship between nutrition and AMD and do not have sufficient information about the dietary modifications for AMD. Third, medical staff provides inadequate explanations. Fourth, most nutrition interventions are not supported by strong behavioural change theory.\textsuperscript{18,20–27} Considering that previous intervention methods have shown disadvantages and poor compliance, it is extremely urgent to develop a more effective method to manage AMD and improve the dietary intervention adherence of AMD patients. Furthermore, understanding the challenges of nutrition intervention adherence is the first and crucial step in developing patient-oriented interventions.

A qualitative method is a tool used to measure non-numerical data collected in the research and experimentation of specific theories and hypotheses. It is the best tool to deeply understand human behaviour and experience.\textsuperscript{28} However, few qualitative studies explore nutrition problems and challenges to the nutrition intervention adherence of AMD patients. The objective of this study was thus twofold. First, it aimed to obtain a patient-oriented understanding of the challenges involved in nutrition intervention adherence among wet AMD patients by using the Capability, Opportunity and Motivation-Behaviour (COM-B) model. Second, it sought to help design appropriate nutrition interventions.

**METHODS**

**Design and setting**

A qualitative study was conducted with one-to-one and face-to-face interviews with wet AMD patients using a semi-structured question guide. The research was performed consistently with a reporting framework of Consolidated Criteria for Reporting Qualitative Research.

**Sample characteristics**

A convenient and purposive sample of AMD patients was recruited from the Southwest Hospital of Chongqing Province in China; the recruitment stopped when the data were saturated. Patients were eligible to enrol on the study if they (1) were diagnosed with wet AMD by an ophthalmologist, (2) were aged above 45 years, (3) had had the disease for more than 3 months and (4) had a clear understanding and willingness to participate in the research. Patients were excluded if they (1) had other eye diseases or a history of surgery that affected their vision, (2) suffered from severe cognitive impairment or mental illness and (3) were affected by other serious systemic diseases, such as malignant tumours.

**Data collection**

The interviews were conducted in an independent and quiet clinic. The participants were informed of the purpose and content of the interview prior to commencing the study, and the oral and written consent were obtained before conducting the interview. The interviews were conducted by an MD (WB) who received initial and ongoing qualitative training from the School of Nursing, Army Medical University, and by two senior qualitative researchers (YL, ZW). The questions focused on exploring the patients’ nutritional challenges and the potential support and programmes for solving them. The open questions helped to obtain more responses from the participants and allowed them to expand on and discuss their thoughts. The following questions were asked: ‘What do you think about the relationship between diet and AMD?’, ‘What kinds of food do you think are good or harmful to AMD patients?’, ‘How do you obtain the nutritional knowledge concerning AMD?’, ‘Have you ever used nutritional supplements? If so, how often do you take them?’, ‘Do you think you have enough knowledge and information about AMD nutrition management? Why?’, ‘What kind of AMD-related nutritional advice would you like to obtain, and through which channels?’.
The whole interview was audio-recorded, and the emotional changes and body language of the interviewees were noted down on the spot. The interviews were transcribed within 24 hours. The transcripts were given to the participants for any corrections or comments, and unclear answers were clarified during a second interview. Demographic information was collected from the participants’ medical records and included age (years), duration of the disease, gender (female/male), marital status, education and affected eye.

Data analysis

Framework

The COM-B model is a comprehensive tool for developing behavioural change interventions. It consists of three components: capability (psychological and physical), opportunity (physical and social) and motivation (automatic and reflective). Psychological capability and physical capability refer to the mental and physical processes required to adapt to lifestyle changes, including social and dietary behaviours. Opportunity refers to the factors outside the individual that make the performance of behavioural changes possible or prompt these changes. Physical opportunity involves the environment, while social opportunity involves social norms and cultural milieus that determine how an individual thinks. Motivation is defined as ‘all brain processes that energize and direct behavior, not just goals and conscious decision-making’; it includes emotional responding, habitual processes and analytical decision-making. Reflective motivation involves plans and evaluations, while automatic motivation deals with emotions and impulses generated by associative learning and/or innate predisposition. The COM-B model was used as a framework to categorise the subthemes in the thematic analysis.

Data analysis steps

Two researchers (WB, ZW) recorded and transcribed the interviews verbatim after repeatedly listening to them. The transcripts were imported into the NVivo 10.0 statistical software and were coded by the first and the second authors. The research group constantly compared the results of the analysis to ensure accuracy.

A qualitative thematic analysis was performed to analyse the data, following the seven-step analysis of Colaizzi. Accordingly, we (1) carefully read all the interview materials, (2) extracted significant statements that were consistent with the phenomenon studied, (3) summarised and refined the meaning of these significant statements, (4) formed the themes, theme clusters and categories by finding common concepts or characteristics, (5) connected the themes with the research phenomenon to create a complete narrative, (6) constituted the essential structure of the phenomenon with the statements and (7) returned the results to the interviewees to verify the authenticity of the content. The analysts and the researchers constantly compared and calibrated the results to ensure accuracy. During the verification process, new information was supplemented and integrated into our identified themes.

Patient and public involvement statement

Patients and the public were not involved in the study’s design, recruitment or conduct.

RESULTS

Participants’ characteristics

Twenty-four patients were recruited in our study. Each interview lasted between 30 and 60 min; no repeated interviews were needed. The mean age of the AMD patients was 69.83 years (SD=7.72). The sample included ten men (41.67%). Among them, seven (29.17%) had primary school education and four (16.67%) had college or higher education. All the patients were married and had been diagnosed with wet AMD for a minimum of 3 months to a maximum of 5 years. Thirteen patients (54.17%) had monocular AMD. All the patients had wet AMD in the late stage of the disease. The characteristics of the participants are presented in detail in table 1.

| Variables                        | n (%)       |
|----------------------------------|-------------|
| Mean age, years (range)          | 69.83 (55–80)|
| Duration of the disease, months (range) | 15.33 (3–60)|
| Gender                           |             |
| Male                             | 10 (41.67%) |
| Female                           | 14 (58.33%) |
| Education                        |             |
| Primary or lower                 | 7 (29.17%)  |
| Secondary                        | 13 (54.17%) |
| College or higher                | 4 (16.67%)  |
| Marital status                   |             |
| Married                          | 24 (100%)   |
| Not currently married            | 0 (0%)      |
| Eye affected by AMD              |             |
| Monocular                        | 13 (54.17%) |
| Bilateral                        | 11 (45.83%) |
| AMD, age-related macular degeneration |

Themes

The themes and subthemes based on the COM-B model are presented in table 2. The participants were identified by using individual identification numbers.

Capability

Psychological capability

Three subthemes were identified and presented in terms of psychological capability, which were (1) insufficient knowledge of nutrition, (2) misconceptions about the disease and treatment and (3) knowledge conflict.
Some patients were aware of the importance of dietary modification and knew that eating more vegetables and fruits was beneficial for their eyes. However, they had insufficient knowledge of nutrition. For example, they did not know what types of nutrients were effective and what kinds of food were rich in those nutrients. Some had even never heard of nutritional supplementation.

I know that diet is very important for my eyes, but I don’t know what to eat and how much I should eat. (No. 2)

I had never heard that antioxidant supplements could improve my vision, and of course, I have never taken any. (No. 6)

Some patients showed a poor understanding of the treatment for AMD and did not know the importance of nutrition intervention. Some of them stated that AMD was a disease of old age and that taking drugs was the only way to slow its progress.

I hadn’t heard that nutrition intervention is good for my eye disease. The doctor said that I need injections for this disease. Can dietary modification alone cure my disease? (No. 3)

Knowledge conflict
The patients often received information in various ways, and this was affected by the sender, the receiver, the information itself and other factors, resulting in confusion and conflict in their understanding.

I also have diabetes. The Ophthalmology Department provides nutritional guidance, as does the Endocrinology Department. I noticed that some vegetables are suggested by the Ophthalmology Department but forbidden by the Endocrinology Department. I am very confused. (No. 11)

I can get a lot of knowledge from TV and the internet, but I don’t know whether it is correct and good for my health. (No. 1)

Physical restriction
There were many barriers to dietary modification because of physical restrictions, such as low vision. A small number of patients said that it was difficult to fully comply with the dietary principles for AMD due to forgetfulness linked to old age, inability to cook because of low vision and too much housework.

I would like to try the recommended diet, but I live alone and I’m old with low vision. It is difficult to eat so many kinds of vegetables and fruits every day. (No. 16)

Limited access to nutrition knowledge
For the patients, the main source of nutrition knowledge was medical staff. Many patients lacked the ability to access knowledge from multiple sources.

We can only learn knowledge from doctors and nurses. They did very well, but I am too old to remember many words. (No. 5)

Opportunity
Physical opportunity
Three subthemes were identified concerning physical opportunity: (1) communication between providers and patients, (2) health insurance and extra charges and (3) food environment.

Communication between providers and patients
Poor communication between medical staff and patients was found. Most patients complained that they could not obtain enough nutritional information from medical staff. Most of the time, the medical staff were too busy to answer their questions on nutritional education, including cooking and the intake of nutrients.

| Broad components of COM-B model | Themes | Subthemes |
|---------------------------------|--------|-----------|
| Capability                      | Psychological | Insufficient knowledge of nutrition |
|                                 |         | Misconceptions about the disease and treatment |
|                                 |         | Knowledge conflict |
| Physical                        | Physical | Limited access to nutrition knowledge |
| Opportunity                     | Physical | Communication between providers and patients |
|                                 |         | Health insurance and extra charges |
|                                 |         | Food environment |
| Social                          | Stigma of disease |
|                                 | Family influence |
| Motivation                      | Reflective | Self-efficacy |
|                                 |         | Attitude |
|                                 |         | Outcome expectancies |
|                                 |         | Lack of professional support |
| Automatic                       | Difficulties in changing eating habits |
|                                 | Mindset |

Table 2  Mapping of themes based on the COM-B model

COM-B, Capability, Opportunity and Motivation-Behaviour.
The doctors and nurses only told me to pay more attention to my diet, but they didn’t say what to eat, how much to eat and how to eat it. I wanted to ask them more but they were very busy all the time. (No. 2)

**Health insurance and extra charges**
The cost of nutritional supplements and the lack of health insurance resulted in discontinued nutrition interventions or follow-ups for many patients. In China, nutrition intervention and supplements are not covered by the healthcare system.

For me, nutritional supplements are expensive and may not be affordable in the long run. (No. 8)

**Food environment**
Some patients mentioned that the environment was a barrier to cooking and eating suitable food. Some of them, for example, had to eat in the workplace canteen.

I’m usually too busy at work, so I eat in the canteen most of the time. It’s difficult to follow the recipe when I eat in the canteen during my working time. (No. 9)

**Social opportunity**
Two subthemes were identified concerning social opportunity: (1) stigma of disease and (2) family influence.

**Stigma**
Some patients were afraid of disclosing their disease because of social stigma. AMD patients are generally considered blind and unable to live normally.

I am afraid that my friend might tease me about my disease. They will regard me as a blind person who can do nothing. I cannot tell them; I feel ashamed. (No. 11)

**Family influence**
The participants relied on the care of their families because of low vision. The level of support received from families greatly influenced the intervention compliance of AMD patients.

I can’t see very well. My wife usually does the cooking and housework. Sometimes I feel it is a burden if I ask her to prepare my diet as recommended. (No. 8)

My daughter always recommends healthy food to me and advises me to prepare healthier dinners that would be better for my eyes. (No. 2)

**Motivation**
**Reflective motivation**
Four subthemes were identified concerning reflective motivation: (1) self-efficacy, (2) attitude, (3) outcome expectancies and (4) lack of professional support.

**Self-efficacy**
Some patients reported that they did not require any assistance with nutrition. In some cases, they changed the recommended dose of nutrients or nutritional supplements without consulting the medical staff.

Sometimes I make some adjustments to my diet according to my knowledge and preference. I don’t have time to consult the doctor because the time is limited in follow-ups. (No. 6)

**Attitude**
Different patients showed different attitudes towards dietary compliance. Some of them said that they could take the initiative to change bad eating habits and take responsibility for their dietary management.

If I know which kinds of food are good for preventing the progression of my disease, I will follow the dietary modification as soon as possible. (No. 3)

However, a small number of patients stated that it was difficult to fully comply with the dietary principles of AMD.

There are four people in my family. Young people usually have to go to work. I have to take care of my one-year-old granddaughter and do a lot of housework every day. It is a waste of time to do the food modification. (No. 19)

**Outcome expectancies**
With AMD, the nutrition intervention lasts for a long time. Patients were thus afraid that the intervention would not be effective and that the improvement was limited.

The dietary intervention is a long process, and I do not know whether it will work and improve my condition in the future. (No. 19)

**Lack of professional support**
The patients mentioned that getting follow-up supervision and guidance after being discharged from the hospital could improve their compliance.

I hope there will be a nutritionist to guide me in how to eat and how to modify my diet based on my daily needs. (No. 6)

I tried the diet recommendations in some books, but later I couldn’t be bothered to do it. I hope you can send us a message or call us to remind us and guide us, especially after we leave the hospital. (No. 16)

**Automatic motivation**
Two subthemes were identified concerning automatic motivation: (1) difficulties in changing eating habits and (2) mindset.
Difficulties in changing eating habits
The participants found it difficult to change eating habits, including cooking habits and food preferences. For example, some of them did not follow the recommended low-fat diet.

The nutrition intervention suggests eating low-fat foods and unsaturated fatty acids. It is a little difficult for me to comply with this rule, as I have eaten more fat food for a long time. (No. 12)

I really don’t like restrictions on my eating habits. Although I know that dietary intervention is good for the disease, I don’t want to follow it, otherwise life will be boring. (No. 12)

Mindset
Mindset was another obstacle to adopting the dietary intervention. To change their diets, the patients need to be in the right frame of mind. Fear of side effects, anxiety, depression and emotional instability exerted a negative effect on them.

I have heard about some nutrition interventions. Although I want to try them, I am also afraid of the side effects or other adverse reactions. Moreover, if this intervention ultimately has no effect on me, I will feel hopeless. (No. 17)

DISCUSSION
AMD is a chronic eye disease that cannot be cured. Different types of the disease have different characteristics. Compared with dry AMD, wet AMD develops more rapidly and becomes a major cause of vision loss. Therefore, it is very important to develop comprehensive strategies to control the disease, including clinical or drug therapies. Nutrition intervention is a simple and low-cost auxiliary strategy to prevent and slow down the progress of AMD, which is promoted and frequently applied in clinical practice. A qualitative study was conducted to explore the challenges of nutrition intervention among wet AMD patients based on the COM-B model. A qualitative approach was chosen so that the patients’ feelings, problems and coping strategies during the nutrition intervention could be more clearly explained and presented.

Capability factors
Poor knowledge and misconceptions about AMD and its treatment were identified as challenges categorised into the ‘capability’ theme. In our study, most of the participants were elderly people with low educational level and nutrition literacy. Many of them lacked sufficient knowledge of nutrition and had misunderstandings regarding nutrition and disease. Some of these misunderstandings included the following statements: ‘Nutritional support just means consuming more vegetables and fruits’, ‘Too much oil intake will lead to coronary heart disease’ and ‘There is no direct relationship between diet and AMD’.

Opportunity factors
In our study, we found that some physical opportunities related to the healthcare system and medical staff could lead to late diagnosis and irregular follow-ups. Improving the healthcare system, developing culturally appropriate nutrition intervention guidelines for AMD, and creating a suitable food environment should be carried out. Furthermore, communication between providers and patients was identified as one of the most significant barriers in terms of the subtheme ‘physical opportunity’. We found that medical staff could not meet the needs of patients for communication and adequate information. This may be the result of staff’s busy clinical work, unclear nutritional responsibilities, or lack of time and communication skills. Today, with the development of multidisciplinary teams and precision nutrition therapy, medical staff play an important role in assessing patients’ nutritional risks, providing relevant knowledge, and designing and implementing interventions. Therefore, comprehensive training programmes should be established for medical staff to improve their nutritional knowledge and communication skills. An alternative solution to solve this problem may involve using mobile
In the subtheme of ‘social opportunity’, stigma was identified as a barrier to intervention compliance, which was scarcely reported as a factor in previous studies.  

Stigma is the main obstacle to the social well-being of older adults with vision impairment. These individuals often find it difficult to talk about their concerns with friends because they are afraid of being treated as blind people, of being looked at differently, of being rejected and even of receiving unfair treatment, all of which will lead to negative feelings. Stigma has also been reported as a factor in low self-esteem, severe social avoidance, poor treatment adherence and social maladjustment. Therefore, people with visual impairment are unlikely to use walkers or participate in social activities because they try to avoid attracting attention to their condition. To improve the psychosocial well-being of people with AMD, programmes focused on education, modelling and enablement could be designed to reduce stigma according to the BCM intervention functions.  

The influence of family was identified as both a facilitator and a barrier to treatment compliance. For most participants, their living abilities were reduced due to visual dysfunction. Family members thus became the main source of functional, emotional and social support. They were also often included in the process of low vision rehabilitation services and exerted a significant impact on the health and rehabilitation outcome of the patients. Therefore, multifaceted interventions based on the role of the family are crucial in reducing stigma and changing unhealthy behaviours.  

Motivation factors  
We also found two opposite attitudes regarding patients’ dietary behavioural modification. Some patients could adapt to this change actively to meet the requirements of nutrition management for the disease, use their initiative to learn relevant knowledge and adjust their dietary behaviour. Others, however, regarded dietary management as a burden, showing a tendency of behavioural or psychological resistance, which is bound to reduce the effect of nutrition intervention. These findings show that interventions should address these beliefs and improve self-efficacy.  

The subthemes ‘outcome expectancies’ and ‘lack of professional support’ were also elicited in terms of reflective motivation. Patients feared the deterioration of the disease and considered its outcome as a primary motivator in initiating and adhering to the intervention. However, the long-term nature of the intervention and the fear of complications led to delayed treatment or cessation of the intervention shortly after initiation, which is consistent with the findings of Giocanti. Moreover, patients expressed the need for professional support, such as monitoring and being reminded of the diet via telephone.  

Individualised nutrition support and intervention programmes could improve patients’ compliance and promote communication among different professionals. Thanks to the development of information and communications technology, some researchers have developed programmes based on telephones, special applications (apps) and programme systems for AMD nutrition management. These technologies can dynamically assess the nutritional status of patients, establish health records, and recommend personalised recipes. For example, Tang et al constructed a nutrition intervention programme based on evidence-based resources and telephone-delivered counselling with a dietitian, which showed the potential to provide needed support for improving nutritional knowledge and dietary practice among AMD patients. Ali used an app to record the daily diets of 54 AMD patients for at least 2 working days and 1 weekend. The intake of various nutrients was calculated and presented in the app. However, due to the design defects of the app (eg, ignoring the usability indicators of the interface design, user participation and user psychological behaviour) and the heavy evaluation burden on participants, patients’ compliance was low. Therefore, when developing apps, we should consider the needs of the patients and modify the content, interface and performance of mobile-based interventions to improve compliance.  

Limitations  
Our study has some limitations. First, all the participants were from our clinic; the results may vary in different hospitals. Second, all the participants were diagnosed with wet AMD because the majority of those who attend the ophthalmology clinic are wet AMD patients. Future studies should increase their samples by including dry AMD patients. Third, personal experience and cultural background might have influenced the interviews in terms of data collection and analysis. However, the study was conducted under the guidance of qualitative research experts, and group discussions were held to ensure the rigour of different opinions.  

CONCLUSIONS  
This study adopted a qualitative approach and conducted in-depth interviews with 24 wet AMD patients to analyse their challenges in nutrition intervention based on the COM-B model. Medical staff should pay significant attention to the process of nutrition intervention and optimise it both in scientific and operational terms. Furthermore, it is necessary to develop professional and internet-based interventions combined with multiple traditional approaches to modify patients’ dietary behaviours and improve their management skills.  

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