• Clinical Research •

Patient satisfaction and follow-up adherence to glaucoma case management clinic in China

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Abstract

● **AIM:** To assess glaucoma patient satisfaction and follow-up adherence in case management and identify associated predictors to improve healthcare quality and patient outcomes.

● **METHODS:** In this cross-sectional study, a total of 119 patients completed a Patient Satisfaction Questionnaire-18 and a sociodemographic questionnaire. Clinical data was obtained from the case management system. Follow-up adherence was defined as completing each follow-up within ±30d of the scheduled time set by ophthalmologists during the study period.

● **RESULTS:** Average satisfaction scored 78.65±7, with an average of 4.39±0.58 across the seven dimensions. Age negatively correlated with satisfaction (*P*=0.008), whilst patients with follow-up duration of 2 or more years reported higher satisfaction (*P*=0.045). Multivariate logistics regression analysis revealed that longer follow-up durations were associated with lower follow-up adherence (OR=0.97, 95%CI, 0.95-1.00, *P*=0.044). Additionally, patients with suspected glaucoma (OR=2.72, 95%CI, 1.03-7.20, *P*=0.044) and those with an annual income over 100 000 Chinese yuan demonstrated higher adherence (OR=5.57, 95%CI, 1.00-30.89, *P*=0.049).

● **CONCLUSION:** The case management model proves effective for glaucoma patients, with positive adherence rates. The implementation of this model can be optimized in the future based on the identified factors and extended to glaucoma patients in more hospitals.

● **KEYWORDS:** glaucoma; patient satisfaction; follow-up adherence; case management
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INTRODUCTION

Glaucoma is the first leading cause of irreversible blindness, severely affecting patients' visual health and quality of life[1-2]. Visual acuity (VA) loss and visual field (VF) defects caused by pathological high intraocular pressure (IOP) are the main features of the disease. Due to rapid ageing trends, it is estimated that global prevalence of glaucoma will increase from 76 million in 2020 to 111.8 million in 2040[3]. As one of the countries with the highest prevalence of glaucoma and glaucoma-related vision impairment[4], China has high rates of blindness, low rates of diagnosis and follow-up, which has become a major public health concern in healthcare systems[5]. Patient satisfaction is a measure of patient satisfaction with the services provided by medical staff, and receives tremendous attention as an indispensable component of high-quality healthcare systems[6]. It is widely recognized as a crucial indicator of care quality in hospitals across many countries. Hospitals can use patient-specific satisfaction metric to identify areas for improvement, ultimately enhancing the patient experience and clinical outcomes[7]. Previous studies have shown that higher satisfaction is associated with persistence, compliance, self-care behavior effectiveness, and improved prognosis[8-9]. For instance, a study focusing on hypertension found that patients who feel more satisfied with healthcare services exhibited greater medication adherence[10]. Additionally, patient-reported physical function, pain interference, and anxiety are associated with satisfaction among hand clinic patients[11]. However, minimal research is available regarding patient satisfaction in the glaucoma population in China. What is known about glaucoma patients' satisfaction with care mainly comes from the UK and the US.

Levy and Booth[12] conducted a glaucoma patient satisfaction survey in a community optometry clinic in the UK found that 90.4% of patients surveyed were highly satisfied with their care, and a similar survey revealed that reducing the waiting time to see a doctor was a key aspect to improve satisfaction[13]. In a US urban tertiary referral clinic, patients reported high satisfaction with their care (mean score 4.62), which was influenced by age, race, and education level[14]. Nevertheless, the health care systems of the UK and the US differed from that of China. Therefore, patient satisfaction and its related influencing factors deserve attention within the Chinese population.

Since visual impairment progresses slowly in most glaucoma patients, regular follow-up is critical for physicians to monitor change of VA and VF and adjust treatment plans[15-16]. However, multiple studies have shown poor patient adherence to ophthalmologic treatment and follow-up, even when complimentary eye exams were offered[17-18]. Case management, an emerging medical management model, has shown promising results in improving medical outcomes and has gained popularity as a health management service[19]. It has been shown to promote patient follow-up adherence and satisfaction in cancer and other chronic diseases[20-21]. As a typical chronic psychosomatic disease in the field of ophthalmology, our hospital actively explored the glaucoma case management model and increased the one-year follow-up rate from 43% to 65.3%[22], but its long-lasting effect is still unclear.

Therefore, this study aims to assess the satisfaction and follow-up adherence of glaucoma patients under this model, identify influencing factors, and provide insights to enhance glaucoma treatment services and improve the quality of life for glaucoma patients in China.

SUBJECTS AND METHODS

Ethical Approval This study adhered to the Declaration of Helsinki, and ethical approval was obtained from the Eye Hospital of Wenzhou Medical University ethical committee prior to study commencement (Project Number: 2022-065-K-47-01). All eligible patients were informed that this survey was for research purposes only and that their participation or survey responses would not affect their future visits or care.

Participants and Setting This cross-sectional study was conducted at the glaucoma case management clinic of the Eye Hospital of Wenzhou Medical University from April 2021 to February 2022. A total of 119 patients were recruited. The inclusion criteria were as follows: 1) diagnosed with glaucoma or glaucoma suspect. Glaucoma was diagnosed according to the International Society of Geographical and Epidemiological Ophthalmology classification criteria[23]. Glaucoma suspects were patients with any of the following conditions: a) vertical cup-to-disc ratio (VCDR) ≥0.6; b) VCDR asymmetry ≥0.2; c) notching, localized or diffuse loss of the neural rim; d) presence of a nerve fiber layer defect; e) optic disc haemorrhage[24]. 2) one or more follow-up visits at the glaucoma case management clinic; 3) aged 18y or older. The exclusion criteria were as follows: 1) in the absolute stage of glaucoma; 2) patients with any other ocular diseases that might affect the retinal nerve fiber layer or the VF; 3) patients with a history of surgery or severe systemic illness in the past three months; 4) patients diagnosed with a psychiatric disorder or severe cognitive impairment. The exit criteria were as follows: 1) patients drop out of follow-up; 2) unable to continue follow-up due to removal, severe systemic illness, or death during the study period; 3) fail to follow-up on time for 3 consecutive occasions. The process of patient inclusion in the case management clinic is shown in Figure 1.

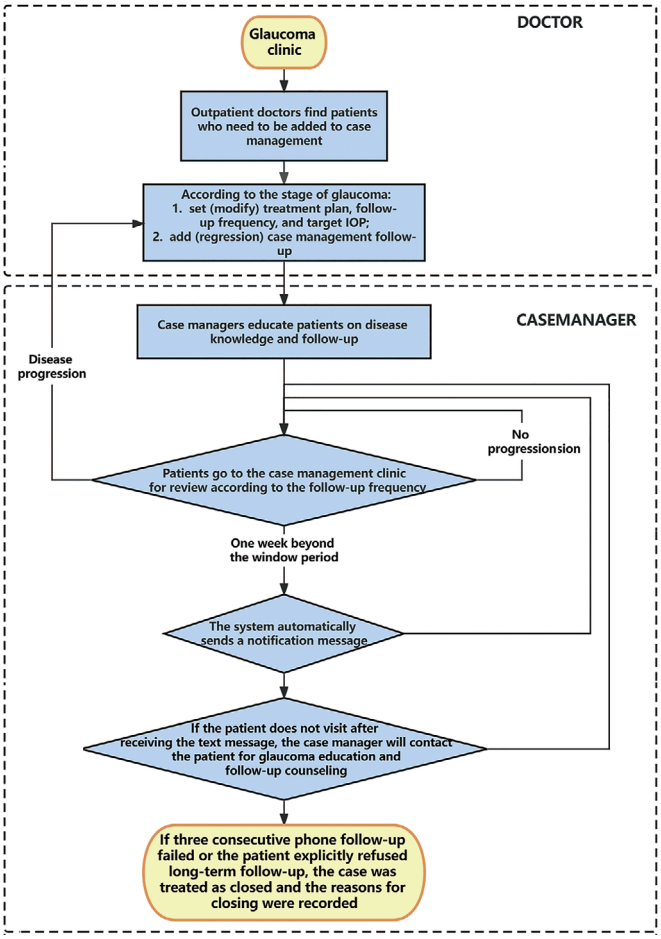

Figure 1 Case management clinic inclusion process.

Data Collection After providing informed consent for their voluntary participation, eligible participants completed a three-part questionnaire. Assistance was available if participants experienced difficulties in reading or completing the questionnaire based on the patient's oral answers. All questionnaires were immediately collected and reviewed to confirm consistency and completeness. The ophthalmological examination results of VA and VF were obtained from the

hospital electronic medical system and were recorded by trained ophthalmologists at the clinical research center of the hospital.

Instrument

Sociodemographic and clinical data The information provided by patients included age, gender, marital status, occupation, annual income, distance from home to hospital, time from home to hospital. The clinical data were collected through the glaucoma case management system, such as type of glaucoma, number of antiglaucoma medications used, operation history, duration of follow-up, frequency of follow-up, the best-corrected visual acuity (BCVA) and the mean defect (MD) of VF. BCVA was determined using the Snellen visual acuity chart and converted to a logarithm of the minimum angle of resolution score (logMAR). VF testing was performed with the Humphrey Field Analyzer 750i (Carl Zeiss Meditec, Inc., Dublin, CA, USA) using the Swedish Interactive Threshold Algorithm (SITA) standard central 24-2 program. The reliability parameters of fixation losses <20% and false positives/negatives <15% were used.

The Patient Satisfaction Questionnaire Short Form The Patient Satisfaction Questionnaire Short Form (PSQ-18) is an authoritative scale based on 18 distinct items and divided into seven dimensions: general satisfaction, technical quality, interpersonal manner, communication, financial aspects, time spent with doctor, and accessibility and convenience[25]. The Chinese version of PSQ-18 reported acceptable reliability and validity of this scale in community health service[26]. Participant responses were provided on a Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree). Items within the same subscale were collectively averaged to generate the score of each of the seven dimensions.

Follow-up adherence The follow-up frequency was based on the stage of damage recommended by the guideline: the doctors followed up patients with mild damage every 6-12mo, patients with moderate damage every 4-6mo, and patients with severe damage every 1-4mo[27]. The case managers informed patients of their upcoming follow-up appointment by text message one week before the follow-up deadline. The adherence of follow-up was defined as the probability that patients completed each follow-up within ±30d of the time set by their ophthalmologists during the study period. The calculation of follow-up adherence was as follows:

1- [unvisited visits/(planned visits + unplanned visits)] × 100%

Two groups were then established: patients with a follow-up adherence of 100% (high follow-up adherence group) and patients with a follow-up adherence of less than 100% (low follow-up adherence group).

Statistical Analysis All statistical analyses were performed using SPSS statistics 25.0 software. Normally distributed data were described as the mean (standard deviation, SD), whilst frequency (*n*) and percentage (%) were used to describe categorical data. The scores of the seven dimensions in the PSQ-18 were expressed as mean±SD and were compared by *t*-tests and ANOVA. In the case of ANOVA significance, LSD multiple comparison testing was performed to further identify significant differences of the means. Simple linear regression was performed to identify factors associated with average satisfaction score (Set dummy variables for multi-classification variables) and variables with $P<0.20$ were included in the multiple linear regression. Two-sample *t*-tests and Chi-square tests were used to analyze the differences between the two follow-up adherence groups, while variables with $P<0.20$ were calculated using a multivariate logistic regression model with adjusted odds ratios (ORs) and 95% confidence intervals (CIs). For all analyses, statistical significance was considered when $P<0.05$ (2-sided).

RESULTS

Sample Characteristics The study sample consisted of 119 patients including 89 glaucoma and 30 glaucoma suspects (61 males, mean age 41.87±15.82y). Totally 71.4% of the participants were married and 62.1% were employed. Concerning the distance from home to the hospital, 84.9% of the participants lived less than 50 km away, with 93.3% of participants being within 2h. Regarding annual income, 45.4% of participants earned more than 100 000 Chinese yuan (CNY). According to the follow-up, 42.9% of the participants have a follow-up frequency of less than 6mo and 44.5% of them have a follow-up frequency of 6-12mo, and most of the participants (61.3%) were followed for more than 12mo. In addition, 56.4% of the patients had received IOP-lowering drugs during the study period, whilst 10.1% of the participants had undergone glaucoma surgery (Table 1). The average logMAR BCVA in the better eye and worse eye were 0.11±0.15 and 0.51±0.76, respectively. The average MD was -5.74±7.88 dB in the better eye and -11.83±10.82 dB in the worse eye.

Satisfaction Scores and Predictors The average score of satisfaction in PSQ-18 was 78.65±7. The overall average score of the seven dimensions was 4.39±0.58 on the 5-point Likert scale. The mean score of patient satisfaction was highest for "communication" (4.62±0.43), followed by "general satisfaction" for case management (4.57±0.43). The lowest mean score was "financial aspects" (4.05±0.74) and "accessibility and convenience" (4.13±0.63).

In terms of technical quality, marital status ($P=0.036$) and follow-up time ($P=0.002$) were two influencing factors. LSD postmortem test revealed that single participants expressed greater satisfaction with the case managers' technique quality than divorced or widowed participants ($P=0.032$). Age was found to be the factor that impacted the satisfaction score of

Table 1 Sociodemographic and clinical characteristics *n*=119

Variables	*n* (%)
Gender	
Male	61 (51.3)
Female	58 (48.7)
Marital status	
Single	31 (26.1)
Married	85 (71.4)
Divorced/widowed	3 (2.5)
Occupation	
Enterprise employee	30 (25.2)
Civil servant	13 (10.9)
Unemployed/retire	15 (12.6)
Self-employed	13 (10.9)
Worker/farmer	18 (15.1)
Student	13 (10.9)
Others	17 (14.3)
Distance from home to hospital (km)	
<10	51 (42.9)
10-50	50 (42)
≥50	18 (15.1)
Time from home to hospital (h)	
≤2	111 (93.3)
>2	8 (6.7)
Annual income (CNY)	
<10000	11 (9.2)
10000-50000	17 (14.3)
50000-100000	37 (31.1)
≥100000	54 (45.4)
Type of glaucoma	
Glaucoma	89 (74.8)
Glaucoma suspect	30 (25.2)
Frequency of follow-up (mo)	
<6	51 (42.9)
6-12	53 (44.5)
≥12	15 (12.6)
Duration of follow-up (y)	
≤2	46 (38.7)
>2	73 (61.3)
Number of antiglaucoma medications used	
0	52 (43.70)
≤2	58 (48.8)
>2	9 (7.6)
Operation history	
Yes	12 (10.1)
No	107 (89.9)

CNY: Chinese yuan.

interpersonal manner (*P*=0.007), communication (*P*=0.005) and financial aspects (*P*=0.008): participants aged 47y or older were less satisfied than participants younger than 33 or 34-47 years old. In regard to satisfaction with communication, unemployed or retired participants were found to be less satisfied than employed participants (*P*=0.005) or students (*P*=0.007), divorced or widowed participants had significantly lower satisfaction scores than single (*P*=0.003) or married participants (*P*=0.018). Statistical significance was found in participants' annual income and follow-up frequency in terms of financial aspects. Participants with annual income more than 100 000 CNY reported higher levels of satisfaction than those who earned between 10 000 and 100 000 CNY (*P*=0.027). Patients followed for 6-12mo reported higher satisfaction than patients followed for less than 6mo (*P*=0.025). In the aspect of time with the doctor, those participants followed up for more than 2y (*P*=0.007) and male (*P*=0.021) showed higher satisfaction scores. Single patients had higher levels of satisfaction than divorced or widowed patients (*P*=0.037). Patients with a distance of more than 50 km from home to hospital resulted in higher satisfaction scores than other two distance (*P*=0.013, *P*=0.005). What's more, male expressed greater satisfaction with case management in terms of accessibility and convenience (*P*=0.017; Table 2).

Multiple linear regression of mean satisfaction incorporated five variables: age, gender, distance from home to hospital, duration of follow-up, and frequency of follow-up. It revealed a negative association between age and satisfaction, as the older the participant, the lower the satisfaction score (*P*=0.008). Participants with a follow-up duration of 2y or more were more satisfied with glaucoma case management than the participants with a follow-up duration of less than 2y (*P*=0.045; Figure 2C). In comparison, gender (Figure 2A), distance from home to hospital (Figure 2B) and frequency of follow-up (Figure 2D) were not statistically different from mean satisfaction score.

Qualified Rate of Follow-up and Influencing Factors The group of high follow-up adherence accounted for 45.38%. Chi-square test showed that there were differences in follow-up period and disease type between the two groups. The results of the multivariate logistics regression analyses demonstrated that participants who were followed up for longer had a lower qualified rate of follow-up (OR=0.97, 95%CI 0.95-1.00, *P*=0.044). Participants with suspected glaucoma had a higher follow-up rate than those with a confirmed diagnosis (OR=2.72, 95%CI 1.03-7.20, *P*=0.044; Figure 3A). In addition, participants who earned more than 100 000 CNY had a higher qualified rate of follow-up than participants with an annual income of less than 10 000 CNY (OR=5.57, 95%CI 1.00-30.89, *P*=0.049; Figure 3C). There was no significant difference in follow-up adherence between patients with a follow-up frequency of <6mo and those with a follow-up frequency of ≥6mo (OR=1.94, 95%CI 0.81-4.68, *P*=0.139) (Figure 3B).

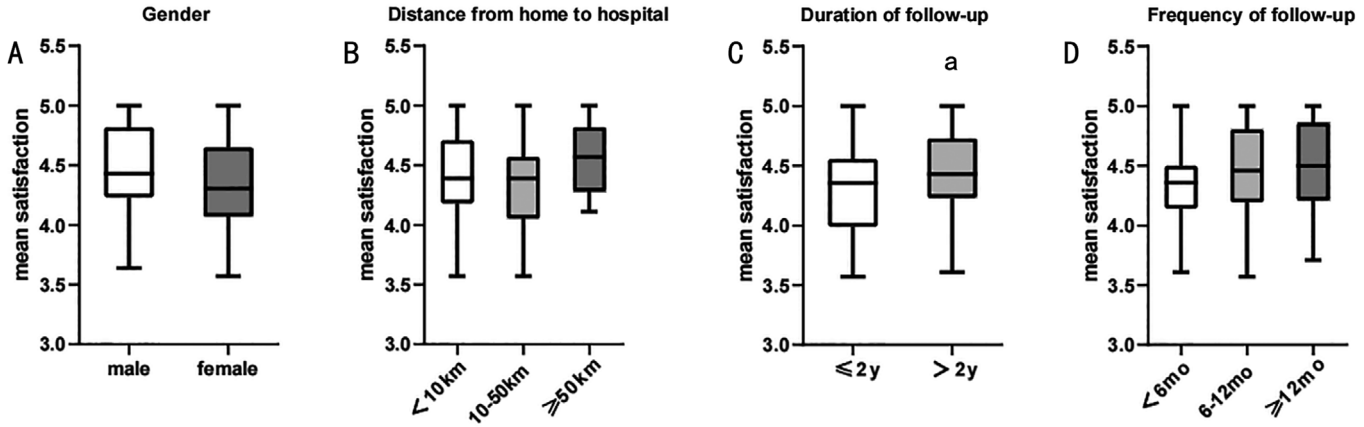

Figure 2 Comparison of mean satisfaction between groups for gender, duration of follow-up, distance from home to hospital, and frequency of follow-up [a]*P*<0.05.

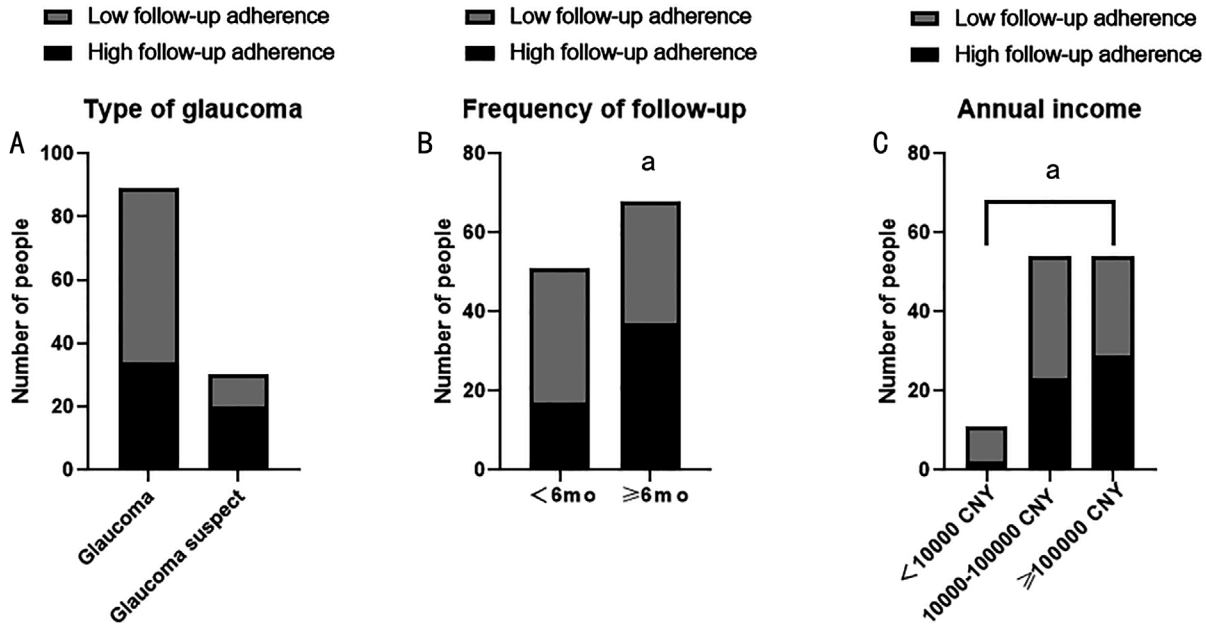

Figure 3 Comparison of follow-up adherence among patients with different types of glaucoma, frequency of follow-up, and annual income
CNY: Chinese yuan. [a]*P*<0.05.

DISCUSSION

Patient satisfaction has become a crucial healthcare assessment metric, increasingly used to gauge care quality and collaboration between patients and healthcare providers[28-29]. Assessing patient satisfaction with healthcare services help identify and address system deficiencies. This was the first study in China to investigate the satisfaction of glaucoma population. Participants reported high satisfaction with their care across the Chinese version of the PSQ-18, highlighting the quick and efficient services in case management. The multiple linear regression model showed that younger glaucoma patients and those with a follow-up duration of 2y or more tend to express higher satisfaction. This might be attributed to younger patients experiencing less vision-related damage and being more focused on vision preservation, resulting in more satisfactory disease control through regular reviews. In addition, since glaucoma necessitates lifelong follow-up and treatment, longer follow-up periods not only enhance patients' understanding of the disease but also foster greater trust in case managers over extended interactions.

Previous studies have identified technical quality or interpersonal manner of the doctor as the highest-rated dimensions of patient satisfaction[14,30-32]. In contrast, our study found that communication dimension received the highest scores. This divergence may be due to patients perceiving case managers, whose roles resemble specialist nurses[33], as lacking the theoretical knowledge and practical skills of professional ophthalmologists. Notably, data from the 2015 National Ophthalmic Capacity Resource Survey indicated a scarcity of ophthalmologists in China, with only 2.89 ophthalmologists per 100 000 people. Effective patient-physician communication has long been associated with patient-centered care and improved satisfaction[34]. Glaucoma case management has significantly increased the patient-doctor ratio, allowing for an

Table 2 Participants' satisfaction scores on seven dimensions

Variables	Mean (SD)	t/F	*P*
1.General satisfaction	4.57±0.43		
2.Technical quality	4.43±0.45		
Marital status		3.42	0.036
Single	4.58 (0.43)		
Married	4.40 (0.45)		
Divorced/widowed	4.00 (0.25)		
Duration of follow-up (y)		9.78	0.002
≤2	4.28 (0.46)		
>2	4.53 (0.42)		
3.Interpersonal manner	4.49±0.53		
Age (y)		5.26	0.007
≤33	4.60 (0.54)		
34-47	4.59 (0.36)		
>47	4.27 (0.61)		
4.Communication	4.62±0.43		
Age (y)		5.59	0.005
≤33	4.76 (0.32)		
34-47	4.64 (0.40)		
>47	4.45 (0.51)		
Occupation		3.73	0.013
Employed	4.67 (0.32)		
Unemployed/retire	4.33 (0.62)		
Student	4.77 (0.39)		
Others	4.50 (0.60)		
Marital status		5.3	0.006
Single	4.76 (0.34)		
Married	4.59 (0.42)		
Divorced/widowed	4.00 (1.00)		
5.Financial aspects	4.05±0.74		
Age (y)		5	0.008
≤33	4.27 (0.71)		
34-47	4.12 (0.71)		
>47	3.77 (0.74)		
Annual income (CNY)		3.42	0.036
<10000	3.77 (0.61)		
10000-100000	3.93 (0.75)		
≥100000	4.24 (0.73)		
Frequency of follow-up (mo)		3.09	0.049
<6	3.86 (0.71)		
6-12	4.19 (0.74)		
≥12	4.23 (0.80)		
6.Time with the doctor	4.47±0.50		
Duration of follow-up (y)		7.61	0.007
≤2	4.32 (0.56)		
>2	4.57 (0.44)		
Gender		2.35	0.021
Male	4.57 (0.44)		
Female	4.36 (0.54)		
Marital status		3.28	0.041
Single	4.63 (0.41)		
Married	4.43 (0.52)		
Divorced/widowed	4.00 (0.50)		
Distance from home to hospital (km)		4.35	0.015
<10	4.44 (0.51)		
10-50	4.39 (0.52)		
≥50	4.78 (0.31)		
7.Accessibility and convenience	4.13±0.63		
Gender		2.41	0.017
Male	4.26 (0.62)		
Female	3.99 (0.61)		

average of half an hour per patient, which could explain the highest score in the dimension of communication with doctors. Establishing regular, long-term patient follow-up is known to enhance glaucoma disease monitoring and reduce adverse outcomes[35]. However, it requires more time and resources, potentially making it less cost-effective, especially for patients with shorter follow-up frequency. This may elucidate why financial aspects received the lowest scores among the seven PSQ dimensions. Previous research has shown that high medical costs are a key driver of patient dissatisfaction[36], aligning with findings from a study across 31 countries that low-income patients tend to be less satisfied with their general practitioners[37].

In our study, 45.38% of the participants belonged to the high follow-up group, which exceeded the 40.3% reported by Ung *et al*[38]. Notably, Ung *et al*'s[38] follow-up duration was limited to 1y, while in our study, 61% of participants were followed up for over 2y, with 37% exceeding 3y. The COVID-19 pandemic has disrupted medication adherence and follow-up in many chronic diseases[39-40]. The follow-up rate in our case management clinic dropped from 85% to 37% between January and March 2020 but gradually recovered in April, significantly affecting overall adherence. With the unforeseeable future, we must engage both health technologies and primary eye care centers for continuity of healthcare services[41-42]. Leveraging new digital technologies that integrate case management and telemedicine may offer a promising approach to transforming glaucoma management[43].

In particular, we observed that glaucoma suspect participants were more likely to adhere to follow-up, which contradicts findings from prior research[18,35,44]. This difference might be attributed to case managers providing thorough explanations about the disease to glaucoma suspect participants, motivating them to follow up to delay disease progression. In contrast, individuals already diagnosed with glaucoma may discontinue treatment upon realizing the irreversibility of the disease or if surgery was ineffective. Additionally, we found that the

annual income of participants was associated with follow-up compliance. While patients with glaucoma require regular follow-up, the costs of transportation, examinations, and treatment can discourage those with lower annual incomes. Further investigation is needed to pinpoint the underlying reasons. A previous study also highlighted that social and economic factors play a role in low follow-up adherence among glaucoma patients, even when they understand the potential consequences of blindness[45].

The case management model, in contrast to traditional outpatient, facilitates collaboration between doctors and case managers. Doctors initially visit patients, adding eligible cases to the management system. Subsequently, case managers gather patient data, provide disease education, and oversee follow-up. When doctors access the system for treatment, they can efficiently review patient records, reducing consultation time and ensuring precise treatment implementation, thus enhancing treatment efficiency. While the glaucoma case management model has improved communication between outpatient doctors and patients, there remains a need to prioritize communication with older age groups and cater to patients with lower annual incomes. Although patients can contact case managers by WeChat and schedule appointments during working hours, some have reported that these appointments disrupt their normal work and school schedules. Future enhancements could include opening weekend clinics to enhance patient care accessibility and convenience.

Despite some meaningful findings, this study inevitably has limitations. The study population was recruited from a single medical center, limiting our power and generalizability. Possibly because of the relatively small sample size, we cannot definitively establish relationships between satisfaction and follow-up adherence. Further larger sample studies are warranted.

In conclusion, the application of the case management model in glaucoma is encouraging. The level of patient satisfaction with case management was high, with the highest ratings for communication and general satisfaction, and the lowest for financial aspects and accessibility and convenience. The results of this study revealed an improvement in the follow-up compliance of the patients; the main influencing factors of follow-up adherence were shown to be the time of follow-up, disease type, and patients' annual income. To further enhance patient satisfaction and follow-up adherence, it is essential to bolster case managers' supervision of glaucoma patients and refine the case management model based on the identified factors from this study.

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Authors' contributions: Lin H performed material preparation, literature search and data collection. Lu HJ contributed to data analysis and drafted the manuscript. Zhou WZ participated in the study conception and revised the manuscript. Zuo SS participated in data analysis. Chen YY provided study design guidance and supervised the entire study. Zhang SD was responsible for the study design and provided essential assistance. All authors read and approved the final manuscript.

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