

Disparities Between People with Diabetic Retinopathy and Community Health Service Centers' Staff in Estimating Satisfaction with Telescreening for Diabetic Eye Diseases

Xiaofeng Zhu

Department of Preventative Ophthalmology, Shanghai Eye Disease Prevention and Treatment Center/Shanghai Eye Hospital

Yi Xu

Department of Preventative Ophthalmology, Shanghai Eye Disease Prevention and Treatment Center/Shanghai Eye Hospital

Lina Lu

Department of Preventative Ophthalmology, Shanghai Eye Disease Prevention and Treatment Center/Shanghai Eye Hospital

Haidong Zou (✉ zouhaidong@sjtu.edu.cn)


Department of Preventative Ophthalmology, Shanghai Eye Disease Prevention and Treatment Center/Shanghai Eye Hospital

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Abstract

Background

The success of the telescreening and management for diabetic retinopathy (DR) in the communities depends on the satisfaction of the people with diabetes, and the community health service centers (CHSCs)' staff, referred to as providers. To investigate the satisfaction of people with DR and CHSCs' staff, with the comprehensive management system for diabetic eye diseases (abbreviated as "the System" in the following text).

Methods

This cross-sectional survey for those receiving the service, included 3817 people with vision-threatening DR (VTDR), focused on the satisfaction with the System, including telescreening process, speed of feedback, interpretation of results, awareness of the related diseases, and eye care service. The survey for the providers, included 234 CHSCs' staff focused on satisfaction and main barriers encountered during the implementation of the System. Sociodemographic characteristics and perceived barriers related to satisfaction were identified by conducting univariate and multivariate logistic regression analyses.

Results

The overall satisfaction of those receiving the service was 96.0%, and 75.8% of them were willing to undergo telescreening for DR the following year. The convenience of telescreening, reasonable and orderly telescreening, and improvement in the related disease awareness significantly correlated with satisfaction. Only 48.3% of the providers were satisfied with the System. The three most mentioned barriers to the development of the System were insufficient technical staff, inadequate funds, and incomplete information transmission system.

Conclusions

Disparities between the high satisfaction of those receiving the service and the low satisfaction of the providers with the System were mainly related to the current weak ophthalmic medical level in the CHSCs and the low awareness of screening for diabetic eye diseases among not only people with DR but the CHSCs' staff.

Background

The prevalence of some chronic diseases (e.g., diabetes and hypertension) continues to rise with the acceleration of aging and transformation of the medical model [1]. These people with chronic diseases should be provided with comprehensive, continuous, and personalized community management and intervention, besides good medical care [2]. Although community-based health service has been conducted and promoted in China for more than 10 years, the development status is not satisfactory and shows significant regional disparity [3, 4]. The level of public health services in the community health service centers (CHSCs) is generally low because of an inadequate number of medical staff, low professional quality, and shortage of medical resources [5, 6].

Under the background of the "Healthy China Action" and "hierarchical medical system," CHSCs, as an important part of the essential healthcare system, are responsible for preventing disease, improving the general quality of life, and promoting health equality [7]. Therefore, it is crucial for CHSCs to undertake the following three tasks: screening and diagnosis of diseases, referral to superior hospitals, and classification management and intervention. Regarding the prevention and treatment of diabetic eye diseases, community screening for people with diabetes can effectively prevent visual impairment and blindness caused by diabetic retinopathy (DR) [8, 9]. DR screening in communities as a regular service has been promoted deliberately by governments in high-income countries such as Europe and the US [10, 11]; however, it is still a great challenge for low- and middle-income countries due to increasing population with diabetes, lack of eye care resources, and limited access to quality and affordable eye care [9, 12, 13]. In addition, most of the known community management guidelines of DR are for high-income countries with high resource allocation, but no standardized management method for community population with DR currently exists in many developing countries including China [14, 15].

A comprehensive management system for diabetic eye diseases (abbreviated as "the System" in the following text) has been established through the Shanghai Diabetic Eye Study (SDES) since 2015, which focuses on telescreening, referral, and management [16, 17]. The new cooperation mode between CHSCs and superior medical institutions not only meets the eye health care of community people with diabetes but also effectively realizes the early screening, diagnosis, and intervention of DR. The success of the System depends on the satisfaction of

those patients receiving the service in communities. Meanwhile, the satisfaction of the CHSCs' staff, who are responsible for DR telescreening and classification management, with the System is also an important factor to judge whether the health system reform can be promoted [18]. The satisfaction of the provider (CHSCs' staff) and those receiving the service with the health service project was often surveyed independently and seldom compared and discussed in the same field of view. This study aimed to investigate the satisfaction of the provider and those receiving the service with the System, understand real demands of people with DR, and clarify difficulties of the CHSCs' staff. The objective was also to develop the policies and interventions so as to further promote the System and improve the usage of community eye care services among the targeted population.

Methods

Shanghai Diabetic Eye Study

The SDES was implemented in all 240 CHSCs from 2015 to 2017. A total of 211,469 people with diabetes, aged 35 years and above, were enrolled. All participants were telescreened for diabetic eye diseases in the communities by the training staff, including presenting visual acuity assessment, autorefractometry, and non-mydriatic fundus photography. Participants diagnosed with vision-threatening diabetic retinopathy (VTDR) after remote retinal image reading were referred to the superior medical institutions for further diagnosis and treatment. People with diabetes were classified as management in the CHSCs based on the diagnosis after telescreening and referrals [16, 17].

Study objects

People with DR receiving the service

All participants were from the SDES. The inclusion criteria were as follows: people with diabetes (1) who completed DR telescreening; (2) who were graded with VTDR by remote retinal image reading; (3) who received classification management of diabetic eye diseases; and (4) who independently completed the self-reported questionnaire. The eligible participants were informed regarding the investigation time and place in detail, and a door-to-door survey was performed for the participants with limited physical mobility.

Providers-CHSCs' staff

All 240 CHSCs' staff were involved in establishing the System, and they are responsible for telescreening and classification management for diabetic eye diseases. The leader of the project "the System" completed the satisfaction survey based on all staff feedback and suggestions.

This study was approved by the institutional review board of Shanghai General Hospital and adhered to the tenets of the Declaration of Helsinki. Written informed consent was obtained from all participants before enrollment.

Satisfaction questionnaire development

The key informant interviews were conducted on both sides of people with DR receiving the service and CHSCs' staff to assess their views and satisfaction regarding all aspects of the System before the satisfaction questionnaire development. The survey for people with DR focused on sociodemographic characteristics and perceived satisfaction with the System, including the convenience of telescreening, community telescreening process, speed of feedback, interpretation of telescreening results, improving awareness of related diseases, and eye care service in the communities. The survey for the CHSCs' staff focused on the current status of prevention and treatment of diabetic eye diseases in the communities, main barriers encountered in the progress of the System, and challenges to be solved in the further long-term development of the System. The satisfaction questionnaire uses a five-point Likert scale ranging from very satisfied to very unsatisfied and multiple-choice questions.

Data analysis

From January 1 to March 31 of the 2018, 3817 participants (3817/4140, 92.2% completion rate) and 234 CHSCs (234/240, 97.5% completion rate) received the satisfaction questionnaire of the System. The data were analyzed using SPSS Version 22.0 (IBM Corp., NY, USA), and a P value < .05 was considered statistically significant. The responses dichotomized between "satisfied" or "very satisfied" were considered as satisfied with the System, while others were considered as dissatisfied with the System.

First, descriptive statistical analysis was applied to analyze the general condition of people with DR, current situation of prevention and treatment of diabetic eye diseases in the CHSCs, overall satisfaction of both those receiving the service and the provider with the System, and their opinions and suggestions. Second, univariate associations with variables of the overall satisfaction of the System were tested using the chi-squared test or independent-samples t test. Furthermore, the variables with significant univariate associations were included in a multivariate logistic regression model to calculate the odds ratios and 95% confidence intervals of the variables related to the overall satisfaction of the System.

Results

Satisfaction of those receiving the service with the System

Sample characteristics

The participants' age ranged from 35 to 93 years with an average age of 66.8 years (standard deviation: 8.2); 82.7% was older than 60 years. More than 40% of the participants had only a primary school education or were illiterate. The sociodemographic data of the participants are elaborated in Table 1.

Satisfaction analysis

The overall satisfaction of those receiving the service with the System was 96.0% (3665/3817), and 75.8% (2892/3817) of them were willing to continue telescreening for diabetic eye diseases in the communities the following year. No significant difference was observed in the overall satisfaction with the System among people with DR living in different areas, with different age, sex, marital status, and educational levels (Table 1).

According to the satisfaction survey regarding all aspects of the System (Table 2), the convenience of community telescreening (95.8%), process of the telescreening (92.0%), environment (94.2%) and staff (95.6%), feedback speed (89.1%) and interpretation (92.0%) of telescreening results, whether to improve the awareness of the related diseases (96.0%), and satisfaction of eye care services provided by the CHSCs (96.1%) were significantly associated with the overall satisfaction ($P < .05$). In the multivariate logistic regression model, the convenience of community telescreening, reasonable and orderly telescreening process, and improvement in the related disease awareness significantly correlated with the overall satisfaction (Table 2).

Satisfaction of the providers with the System

Sample characteristics

Of the 234 CHSCs, only 49 (20.9%) had independent ophthalmic clinics, 78 (33.3%) had ophthalmic and otolaryngologic comprehensive clinics, 47 (20.1%) had ophthalmologists from the superior medical institutions regularly providing eye care service, and 89 (38.0%) had no eye care service.

The number of CHSCs without eye care service in the suburban area was much higher than that in the urban and semi-urban areas (Supplemental Table 1). The prevention and treatment of diabetic eye diseases were integrated into the medical services of the general practice team in 80 CHSCs (34.2%), and into the family doctor services in the 66 CHSCs (28.2%). Moreover, 160 CHSCs (68.4%) signed bilateral cooperation agreements with superior medical institutions (Supplemental Table 2).

Satisfaction analysis

A total of 113 CHSCs' staff (48.3%) were overall satisfied with the System (Table 3). Significant differences were found in satisfaction among the CHSCs' staff in different areas ($\chi^2 = 45.0$, $P < .001$), of which the satisfaction in the semi-urban areas was the highest (78.4%), while that in the suburban areas was the lowest (25.6%). Only 99 CHSCs' staff (42.3%) considered that it was necessary to conduct diabetic eye disease telescreening at the community level for people with diabetes, which significantly correlated with overall satisfaction with the System ($P < .001$). Furthermore, telescreening and management for diabetic eye diseases in the community was considered to incorporate routine work in 119 CHSCs (51.3%) and add to the performance review in 128 CHSCs (54.7%) (Table 4).

Opinions and suggestions of CHSCs' staff on the System

A total of 161 CHSCs' staff (68.5%) thought that diabetic eye disease telescreening and management could be merged with other community health work. Of these, 79 (49.1%) believed that it could be merged with the management of people with diabetes, 52 (32.3%) thought that it could be merged with the physical examination for older adults, and the remaining 30 (18.6%) presumed that it could help in the telescreening for diabetic eye diseases in the outpatient clinic on weekdays (Supplemental Fig. 1).

Regarding the difficulties in the long-term development of the System (Fig. 1), the three most mentioned barriers were insufficient technical staff for telescreening in the communities, insufficient working funds, and incomplete information transmission system for telescreening. Moreover, inadequate telescreening equipment, insufficient staff training, and fees for eye health care were also more frequently mentioned barriers. Other barriers included the lack of publicity of telescreening for diabetic eye diseases in the communities, low compliance of eye health screening among people with diabetes, slow feedback of remote reading, and recommendation for a referral green channel.

Discussion

Telescreening for DR has matured; consequently, CHSCs are capable of providing screening, diagnosis, management, and follow-up for diabetic eye diseases, which has greatly improved the coverage rate of people with diabetes and the accessibility of eye care services [19]. Telescreening for DR in the communities has significant advantages in the System in Shanghai, but many challenges still exist. One of these is whether people with diabetes and CHSCs' staff were satisfied with the System. A satisfaction survey is a handy quantitative tool for obtaining information directly from those receiving the service and providers involved in the System [18]. Higher satisfaction of those receiving the service can improve their willingness to participate in telescreening for diabetic eye diseases again in the future, while increasing the popularity of the System. At the same time, higher satisfaction of the providers is closely related to the implementation efficiency and the long-term development of the System [20].

This study investigated the satisfaction of those receiving the service and providers participating in the System in Shanghai. The findings were as follows.

First, a large majority of people with DR were satisfied with telescreening for diabetic eye diseases in the community. Also, they were willing to participate in the System the following year, which was consistent with other studies that reported higher satisfaction in people with diabetes for DR telescreening [18, 21]. The overall satisfaction was significantly related to the actual experience of people with DR during the telescreening process. The convenience of telescreening, reasonable and orderly arrangement of telescreening process, and ability to improve awareness of related diseases were significantly associated with the overall satisfaction with the System among people with DR. Similar to findings in other countries, people with diabetes believed that DR telescreening, compared with traditional fundus examination, was more convenient and faster, reduced the time and cost to visit doctors, increased the understanding of their own diseases, and provided support for further clinical diagnosis and treatment [21–23]. Therefore, further optimizing the process of DR telescreening, providing a spacious and neat telescreening environment, providing timely feedback of telescreening results and referral recommendations, and strengthening the training of community staff and the education on related diseases for people with DR were crucial to improve those DR patients' satisfaction with the System.

Second, the overall satisfaction of the CHSCs' staff with the System was not ideal. Less than half of the CHSCs' staff were satisfied with the System, and the satisfaction of the suburban CHSCs' staff was relatively lower. According to the present survey, nearly two fifths of the CHSCs did not provide eye care services, and this situation was especially obvious in the suburban CHSCs. Thus, weaker ophthalmic clinical competence in the suburban CHSCs caused a heavier telescreening workload, resulting in lower satisfaction with the System. Through the establishment of the System, one third of the CHSCs included the prevention and treatment of diabetic eye diseases into the services of general practitioners or family doctors, among which the CHSCs in urban areas had the highest proportion. Nearly 70% of CHSCs signed bilateral cooperation with superior medical institutions, with the highest proportion in urban areas. However, nearly half of the CHSCs' staff complained that telescreening for diabetic eye diseases at the community level was not necessary at present considering the shortage of the manpower and medical resources, and this was significantly associated with the overall satisfaction with the System. Meanwhile, many of the CHSCs suggested to merge diabetic eye disease telescreening and management with the management of people with diabetes, physical examination for older adults, or routine outpatient clinic on the weekdays. Furthermore, several problems needed to be solved for the long-term development of the System. First, the community manpower was insufficient, especially those who could operate the telescreening equipment, particularly non-mydratic fundus photography. Hence, opportunities and frequency of training for the CHSCs' staff should be increased. Second, insufficient funds affected project implementation and staff motivation. Third, insufficient telescreening equipment affected the efficiency of screening. Meanwhile, it was necessary to improve the information management system of telescreening, increase the publicity of the System, and enhance the disease awareness of community residents. Superior medical institutions should improve the speed of remote reading feedback and set up a referral clinic for people needing further diagnosis and treatment for DR, so as to improve compliance and satisfaction with a referral. Furthermore, personalized risk-based screening schedules should be examined to optimize workload and sojourn time in telescreening programs for diabetic eye diseases [24, 25].

This is the first time to investigate the satisfaction of those receiving the service and the providers with the telescreening for DR in the communities. The participants including the people with VTDR and CHSCs' staff were recruited from all the communities in Shanghai, and this could better reflect the majority and diversity. Nevertheless, the present study had several limitations. All participants who receiving the service were diagnosed with VTDR, lack of a control group (with mild diabetic retinopathy or no apparent retinopathy), may limit the applicability of the findings. Moreover, the satisfaction with the System need to recall, but it could lead to inaccurate results owing to poor memory.

Conclusions

The present study found the disparities between the high satisfaction of those receiving the service and the low satisfaction of the providers with the System, which was mainly related to the current weak ophthalmic diagnosis and treatment level in the CHSCs and the low awareness of screening for diabetic eye diseases among not only people with diabetes but the CHSCs' staff. Therefore, it is important to improve the satisfaction of the CHSCs' staff with the System. For example, measures should be taken to establish a new performance evaluation system, strengthen the training of the CHSCs' staff, improve the allocation of community ophthalmic equipment, and increase the publicity, education, and financial support. The satisfaction of people with DR and the CHSCs' staff should be considered as the double assessment criteria to measure the effectiveness of public health projects, so as to effectively improve the satisfaction of those receiving the service and the providers in the reform of the community medical and healthcare system.

List Of Abbreviations

CHSCs Community health service centers

DR Diabetic retinopathy

The System A comprehensive management system for diabetic eye diseases

SDES Shanghai Diabetic Eye Study

VTDR Vision-threatening diabetic retinopathy

Declarations

Ethics approval and consent to participate

This study was approved by the institutional review board of Shanghai General Hospital and adhered to the tenets of the Declaration of Helsinki. Written informed consent was obtained from all participants before enrollment. The trial was registered with the Clinicaltrials.gov (NCT03579797).

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

XZ and YX analyzed and interpreted the patient data. XZ was a major contributor in performing the clinical trial. HZ and LL contributed to the study design and interpretation. All authors read and approved the final manuscript.

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Authors' information

Xiaofeng Zhu, Email: carrie915@126.com.

Yi Xu, Email: xxy1982@hotmail.com.

Haidong Zou, Email address: zouhaidong@sjtu.edu.cn.

Lina Lu, Email address: lulina781019@qq.com.

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Tables

Table 1. Descriptives and satisfaction of the people with diabetic retinopathy with the System

	Satisfaction					Total (No. [%])	Univariate ^a	
	Very unsatisfied	Unsatisfied	No Opinion/ Don't Know	Satisfied	Very satisfied		χ^2 Value	p Value
District (No. [%])							2.66	0.26
Urban area	0 (0)	7 (0.6)	34 (3.1)	756 (68.9)	301 (27.4)	1098 (28.8)		
Suburb area	1 (0.1)	14 (0.9)	46 (2.9)	1159 (74.1)	344 (22.0)	1564 (41.0)		
Semi-urban suburb area	1 (0.1)	4 (0.3)	45 (3.9)	850 (73.6)	255 (22.1)	1155 (30.3)		
Gender (No. [%])							1.52	0.22
Male	0 (0)	15 (0.9)	51 (3.1)	1195 (71.6)	408 (24.4)	1669 (43.7)		
Female	2 (0.1)	10 (0.5)	74 (3.4)	1570 (73.1)	492 (22.9)	2148 (56.3)		
Age (No. [%])							7.80	0.10
≤50	0 (0)	2 (2.3)	1 (1.2)	73 (84.9)	10 (11.6)	86 (2.3)		
50~60	0 (0)	1 (0.2)	18 (3.1)	420 (73.3)	134 (23.4)	573 (15.0)		
60~70	0 (0)	13 (0.8)	51 (3.0)	1222 (71.2)	430 (25.1)	1716 (45.0)		
70~80	2 (0.2)	9 (0.7)	45 (3.7)	882 (72.8)	274 (22.6)	1212 (31.8)		
≥80	0 (0)	0 (0)	10 (4.3)	168 (73.0)	52 (22.6)	230 (6.0)		
Marital Status (No. [%])^b							2.92	0.09
With a partner	1 (0)	21 (0.6)	104 (3.0)	2510 (72.5)	824 (23.8)	3460 (90.6)		
Without a partner	1 (0.3)	4 (1.1)	21 (5.9)	255 (71.4)	76 (21.3)	357 (9.4)		
Education level (No. [%])							7.39	0.60
Illiteracy	0 (0)	6 (1.7)	15 (4.2)	262 (72.8)	77 (21.4)	360 (9.5)		
Primary school	1 (0.1)	9 (0.7)	41 (3.3)	893 (72.4)	289 (23.4)	1233 (32.4)		
High school	1 (0.0)	8 (0.4)	62 (3.1)	1466 (72.3)	491 (24.2)	2028 (53.3)		
College degree or above	0 (0)	2 (1.1)	7 (3.8)	137 (73.7)	40 (21.5)	186 (4.9)		

^a, Chi-squared test or independent-samples t test for univariate associations with variables of the overall satisfaction of the System.

^b, With a partner included married and domestic partnership, and without a partner included single, separated, divorced and widowed.

Table 2. Description of satisfaction with various phases of the telescreening in people with diabetic retinopathy

		Satisfaction No. [%]					Univariate Analysis ^a		Multivariate Analysis ^b	
		Very unsatisfied	Unsatisfied	No Opinion / Don't Know	Satisfied	Very satisfied	χ^2 Value	P Value	OR (95% CI)	P value
Convenience of telescreening in the community		3 (0.1)	25 (0.7)	131 (3.4)	2722 (71.3)	936 (24.5)	121.9	<0.001	3.59 (2.09-6.15)	<0.001
Telescreening field	The process was reasonable and orderly.	7 (0.2)	41 (1.1)	255 (6.7)	2814 (73.7)	698 (18.3)	100.9	<0.001	2.91 (1.69-5.00)	<0.001
	The layout was reasonable, and the environment was neat.	1 (0.0)	30 (0.8)	188 (4.9)	2860 (74.9)	736 (19.3)	36.7	<0.001	-	-
	The staff's instruction was clear, and attitude was kind.	1 (0.0)	25 (0.7)	138 (3.6)	2831 (74.2)	818 (21.4)	41.4	<0.001	-	-
Speed of feedback		16 (0.4)	164 (4.3)	236 (6.2)	2729 (71.5)	671 (17.6)	32.7	<0.001	-	-
Interpretation of telescreening results		4 (0.1)	55 (1.4)	245 (6.4)	2751 (72.1)	761 (19.9)	74.7	<0.001	-	-
Improving awareness of related diseases		2 (0.1)	25 (0.7)	125 (3.3)	2762 (72.4)	899 (23.6)	106.6	<0.001	2.38(1.35-4.18)	0.003
Eye care service in the community		2 (0.1)	25 (0.7)	124 (3.3)	2762 (72.5)	899 (23.6)	101.6	<0.001	-	-

OR, Odds ratio.

a, Chi-squared test for univariate associations with variables of the overall satisfaction of the System.

b, Variables with significant univariate associations included in a multivariate logistic regression model.

Table 3. Description of satisfaction with the System among the community health service centers' staff

District	Satisfaction (No. [%])				
	Very unsatisfied	Unsatisfied	No Opinion/ Don't Know	Satisfied	Very satisfied
Urban area	4 (5.4)	31 (41.9)	6 (8.1)	30 (40.5)	3 (4.1)
Suburb area	11 (12.8)	49 (57.0)	4 (4.7)	17 (19.8)	5 (5.8)
Semi-urban suburb area	0 (0)	6 (8.1)	10 (13.5)	52 (70.3)	6 (8.1)
Total	15 (6.4)	86 (36.8)	20 (8.5)	99 (42.3)	14 (6.0)

Table 4. Necessity of screening for diabetic eye diseases in the communities and correlation with the satisfaction

	Telecreening for diabetic eye disease			Correlation with the overall satisfaction	
	Necessary	Don't Know	Unnecessary	χ^2 Value	P Value
Telecreening in the community	99(42.3)	23(9.8)	112(47.9)	117.60	<0.001
Incorporate routine work	119(51.3)	20(8.6)	93(40.1)	1.09	0.58
Added to performance review	128(54.7)	28(12.0)	78(33.3)	0.75	0.69

Figures

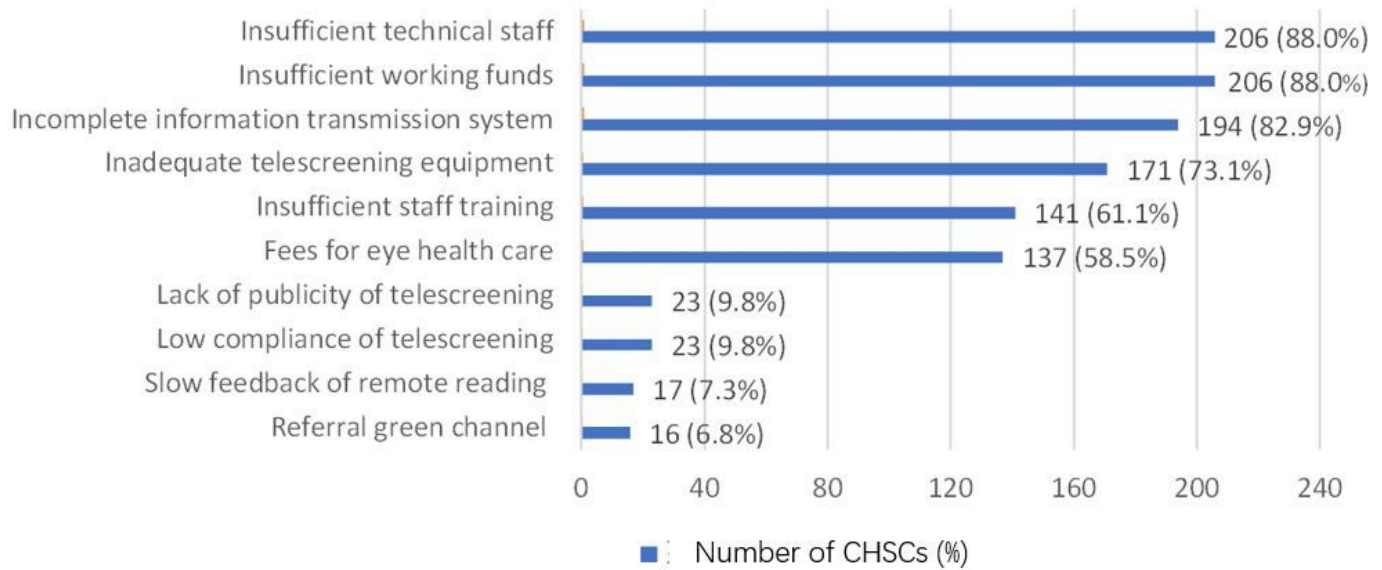


Figure 1

Regarding the difficulties in the long-term development of the System (Figure 1), the three most mentioned barriers were insufficient technical staff for telecreening in the communities, insufficient working funds, and incomplete information transmission system for telecreening.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SFigure1.pdf](#)
- [STable1.pdf](#)
- [STable2.pdf](#)