

Comparing the effectiveness of different postoperative counseling methods for post-keratoplasty patients

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Purpose: To compare various counseling methods for improving patient education, compliance, and administration of eye drops prescribed for post-optical keratoplasty patients and assess the most efficient counseling method. **Methods:** A prospective, questionnaire-based pilot study was conducted among 60 post-optical keratoplasty patients who were randomly assigned into three groups for postoperative eye drop counseling, namely group 1 (video counseling), group 2 (chart counseling), and group 3 (verbal counseling at Cornea department). The questionnaire was answered by the patients/attendants applying the eye drops on the first 3 consecutive visits. McNemar–Bowker test was used to compare responses in each group and the Kruskal–Wallis test was used to compare responses among the three groups. The Institutional Ethics Committee of Aravind Eye Hospital, Tirunelveli (Registration number ECR 816/Inst/Tn/2016) approved this study. **Results:** Results demonstrated improvement in various categories assessed regarding drop administration in all three groups, which assessed patients' knowledge, attitude, and hygiene. Although all three groups showed improvements during subsequent follow-up visits, the video-counseling method was found to be an effective means of communication. **Conclusion:** Our study emphasizes that the nonverbal and noncontact means of communication by video demonstration would be an effective way of counseling. It can be considered in the present scenario of the pandemic as well.

Key words: Chart counseling, eye drop counseling, postoperative care, verbal counseling, video counseling

Corneal transplantation is the most common and successful form of tissue transplant. Approximately 4.9 million bilateral corneal blind persons worldwide are benefitted from corneal transplantation.^[1,2] The survival of first-time corneal grafts is 90% at 5 years and 82% at 10 years, with reported allograft rejection rates following penetrating keratoplasty ranging from 5% to 18%.^[3-5] In developing countries, patients' noncompliance to topical therapy and follow-up is the most important and preventable cause of graft rejection. Thus, the role of counselors is imperative to explain the proper eye drop applying technique to the patients and the need for 100% on-date follow-up.^[6-8] However, in today's overburdened clinical settings, many patients receive little or no instruction on proper administration techniques. Improper and chronic topical steroid use in post-optical keratoplasty patients can predispose to ocular infections. As such, they need to be educated about the proper hygienic technique of eye drop usage, storage, and regular follow-up. Thus, this pilot study aimed to compare the current time-tested verbal counseling technique to the use of distinctive counseling techniques, such as educational charts and videos, concerning the time saved, improvement in patient compliance,

and proper hygienic administration of eye drop prescribed for post-optical keratoplasty.

Methods

This prospective, randomized controlled questionnaire-based pilot study was done between June 2020 and January 2021 at Cornea Services, Tertiary Eye Care Hospital and Postgraduate Institute of Ophthalmology, Tamil Nadu, India. We enrolled 69 subjects out of 93 patients who underwent optical keratoplasty for various corneal conditions such as corneal scar, pseudophakic bullous keratopathy, and keratoconus. Inclusion criteria: all participants who were willing to participate in the study and above 18 years who were able to read and write the native language, and those who received multiple eye drops as a postoperative treatment for keratoplasty. Exclusion criteria: subjects suffering from cognitive impairment, patients who were not willing for the study, patients with systemic diseases, old-age patients or physically challenged, and patients who received concurrent treatment (e.g. patients with the persistent epithelial defect for whom amniotic membrane

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grafting was done) and in whom graft resuturing for edge lift, etc., (that interfered with the study results) were performed.

After surgery, patients were admitted to the hospital for 3 days during which our duty nursing staff applied eye drops. On discharge, all patients were verbally counseled on the usage of eye drops and asked for a review after one week. From the first review visit, patients were randomly divided into three groups (total of counseling assigned to each group), namely group 1- video counseling, group 2- chart counseling, and group 3- verbal counseling done by a single counselor at 1 week, 1 month, and 3 months postoperatively, and were asked to fill up the questionnaire [Table 1] at each follow-up visit dedicated to understanding how well the different methods of counseling helped in improving the patient’s knowledge, attitude, and hygiene during application of topical medications. It was prepared based on the study published by Vakros and McVeigh in Clinical Ophthalmology.^[9] The responses to this questionnaire were recorded on a 4-point scale as “Every time,”

“Often,” “Once a week or less,” and “Never.” The internal consistency of this questionnaire was validated using a standard test Cronbach’s Alpha (ranges from 0 (low consistency) to 1.0 (higher consistency)). The test values indicate the higher internal consistency on the first visit of each group (video = 0.94; chart = 0.91; verbal = 0.89). The video and chart [Fig. 1] used for counseling were designed and developed by the authors of this study. Demographic data collected included age, sex, occupation, social circumstances, indication for surgery, type of keratoplasty done, and drop administration (duration, frequency, number of drops, storage, and person administering). Finally, informed consent was obtained from all participants before enrolment, and the protocol followed the tenets of the Declaration of Helsinki. The Institutional Ethics Committee of Aravind Eye Hospital, Tirunelveli (Registration number ECR 816/Inst/Tn/2016) approved the conduction of this study.

Statistical analysis

Responses to the pre- and post-counseling methods (video, chart, and verbal) were summarized as frequency (percentage).

Table 1: Eye drop counseling questionnaire

Questions	Answers
1. How often do you remember to wash your hands before using your eye drops?	1. Every time 2. Often 3. Once a week or less 4. Never
2. How often do you remember to shake the bottle before use?	1. Every time 2. Often 3. Once a week or less 4. Never
3. How often you are sure of applying (Self application) each drop correctly into the eye?	1. Every time 2. Often 3. Once a week or less 4. Never
4. How often does the bottle tip touch the eye/finger when using your eye drops?	1. Every time 2. Often 3. Once a week or less 4. Never
5. How often do you forget to use your eye drops?	1. Every time 2. Often 3. Once a week or less 4. Never
6. How often do you follow the instruction given to open the eye drop the first time you use it?	1. Every time 2. Often 3. Once a week or less 4. Never
7. How often do you remember to close your eyes or press on the tear ducts after putting the eye drop?	1. Every time 2. Often 3. Once a week or less 4. Never
8. How often do you remember to leave 5-minute intervals between different drops?	1. Every time 2. Often 3. Once a week or less 4. Never
9. If you use drops and ointments, how often do you remember to use the drops first?	1. Every time 2. Often 3. Once a week or less 4. Never
10. How often do you discard your bottle after 28 days of use?	1. Every time 2. Often 3. Once a week or less 4. Never

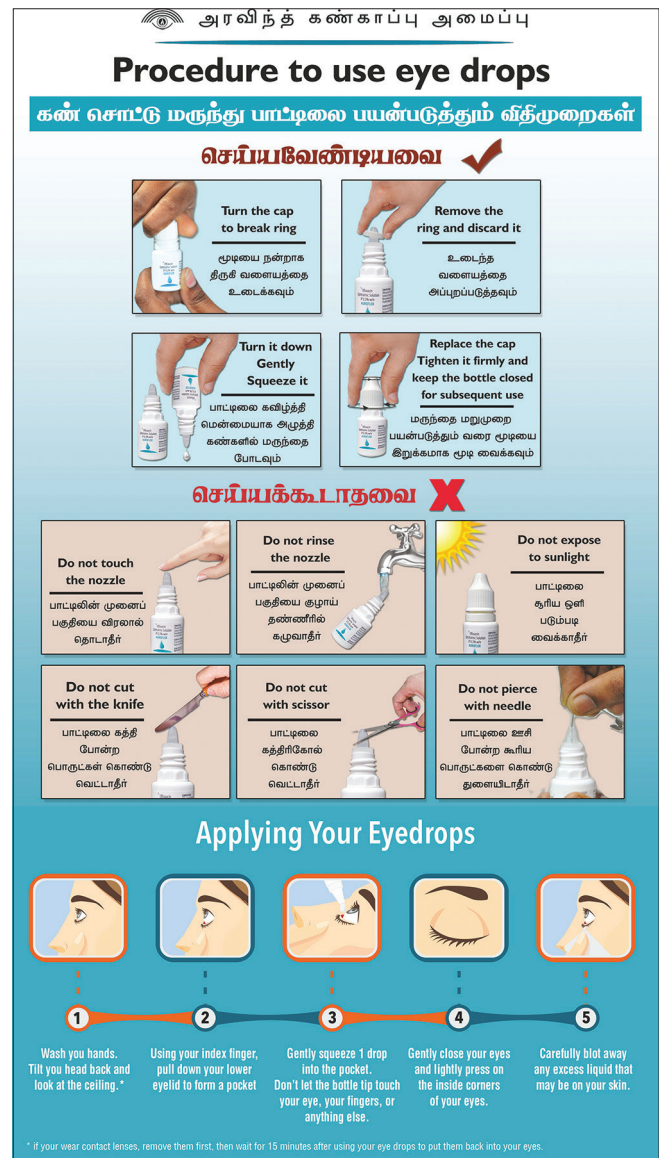


Figure 1: Chart method of eye drop counseling

McNemar–Bowker test was used to compare responses in each group over three visits and the Kruskal–Wallis nonparametric test was used to compare responses among the three groups.

Results

Sixty patients (20 patients in each group) out of 69 enrolled were included in the statistical analysis; the mean age of the study population was 52 ± 14 years (range: 21–78 years). Nine subjects were excluded as the questionnaires were not adequately completed. The demographic and clinical characteristics of the included patients are enumerated in Table 2. All patients were using topical eye drops for more than 1 year. In addition, four (6.6%) patients were using only one topical eye drop, 43 (71.6%) patients were on two drops, and 13 (21.6%) patients were on three different drops at the last visit. Of these, 47 (78.3%) patients were on only post keratoplasty medications, while 13 (21.6%) subjects had comorbid conditions such as glaucoma for which they were on anti-glaucoma medications as well. Moreover, our study revealed that 11 (18%) patients self-administered their eye drops, while 49 (82%) patients had their eye drops instilled by caretakers. Finally, regarding the storage of the eye drops, seven (11.6%) patients stored their eye drops in the bathroom, while 29 (48.3%) and nine (15%) stored them by their bedside cabinets and fridge, respectively. Fifteen (25%) patients stored their drops in various places other than the aforementioned. It was evident that those who stored their drops in the fridge or various other places reported a higher frequency of missed eye drops than those who opted for the bedroom.

Table 2: Demographics of the study subjects

Demographics	No. of subjects
Sex	
Male	34 (56.7%)
Female	26 (43.3%)
Age (years)	
20-40	14 (23.3%)
41-60	30 (50%)
>60	16 (26.7%)
Occupation	
Retired	14 (23.3%)
Unemployed	26 (43.3%)
Working	20 (33.3%)
Living Circumstances	
Alone	6 (10%)
Family	38 (63.3%)
Spouse	16 (26.7%)
Keratoplasty Indication	
Corneal opacity	4 (6.7%)
Failed graft	18 (30%)
Keratoconus	7 (11.7%)
PBK	20 (33.3%)
Others	11 (18.3%)
Type of Keratoplasty	
DALK	5 (8.3%)
DSEK	22 (36.7%)
PKP	33 (55%)

After randomization of patients into different groups, the hygiene, knowledge on the eye drop usage methods, drop instillation techniques, and the need for compliance was discussed with the patients through verbal, video, and chart [Fig. 1] counselling. The questionnaire consists of ten questions, which were prepared based on the following parameters and given to patients for completing in the follow-up visits:

A. Understanding on the hygiene to be followed before using eye drop:

Q1: How often do you remember to wash your hands before using eye drops?

B. Knowledge on eye drops usage:

Q2: How often do you remember to shake the bottle before use?

Q3: How often you are sure of applying (Self application) each drop correctly into the eye?

Q6: How often do you follow the instructions given to open the eye drop the first time you use it?

Q7: How often do you remember to close your eyes or press on the tear ducts after putting the eye drop?

Q8: How often do you remember to leave 5 minutes between different drops?

Q9: If you use drops and ointments, how often do you remember to use the drops first?

Q10: How often do you discard your bottle after 28 days of use?

C. Understanding of the need for Compliance of using eye drop:

Q5: How often do you forget to use the eye drop?

D. Understanding of the technique of eye drop instillation:

Q4: How often does the bottle tip touch the eye/finger when using your eye drops?

The following are the results of the questionnaire in the three different groups of counseling methods.

Video Counselling Group:

A) With regard to the understanding of hygiene in the video group, only four patients remembered to wash hands during the first visit, which improved to 18 in the second visit and 20 in the third visit.

B) With respect to the understanding/knowledge of the method of usage, only four patients remembered to shake the bottle in the first visit, 17 during the second visit, and 20 during the third visit. Only four patients understood that one drop should be administered each time when applied in the first visit and improved to 16 patients in the third week. Nineteen patients remembered and followed the instruction to open the eye drop at the third visit compared to one patient at the first visit. Seventeen patients remembered to close their eyes after drop instillation in the third week compared to one patient at the first visit. Eighteen patients learned to use multiple drops at 5-minute intervals and learned that eye drop has to be used before ointment usage and the eye drop bottle has to be discarded after 28 days of usage during the third visit compared to the first visit.

C) Concerning the compliance, only nine patients out of 20 never missed drop use during the first visit, improved to 20 in the second visit, and reduced to 17 in the third week. Two patients missed eye drop even after repeating video counseling in the third week.

D) All the patients thoroughly understood the technique of using eye drops without touching the bottle tip with a finger.

Chart Counseling Group:

- A. Toward the hygiene practice in the chart group, eight patients remembered to wash hands in the first visit, 16 in the third week.
- B. With regard to the understanding of the eye drop method, eight patients remembered to shake the bottle, knowing that one drop has to be applied during each time of instillation in the first visit compared to 13 in the second week and 16 in the third week. Only one patient followed the instruction to open the eye drop at the first time of usage and remembered to close their eyes after the drop is applied at the first visit compared to 11 at the third visit. Only 12 remembered to leave 5-minute intervals between eye drops, to use eye drops before ointment, and to discard the eye drop after 28 days.
- C. With relevance to compliance with eye drop, 13/20 never missed using drop in the first visit and 20 in the third visit. No patients missed the eye drop during the third visit.
- D. With regard to the proper technique of eye drop administration, all 20 patients never touched the bottle tip while using it.

Verbal Counseling Group:

- A. The hygienic practice of washing hands before instilling the drop was understood by 12 participants, which was higher than those in the first week (3) and second week (11).
- B. Pertaining to understanding the eye drop instillation method, 13 remembered to shake the bottle before use compared to three in the first week and 10 in the second week. Only five remembered to follow the instruction to open the bottle, to close the eyes after putting eye drops, and to discard the eye drop after 28 days of usage in the third week. Only seven remembered to take a 5-minute interval between eye drops and to use eye drops first before ointment in the third visit.
- C. With reference to compliance, all 20 patients never missed using an eye drop in the third week compared to 17 in the second and 14 in the first visit.
- D. In terms of understanding the proper technique, 20 patients never touched the bottle tip during usage in the third week, which was higher than the number of participants in the second visit (17) and first visit (14).

Comparison of responses between three groups:

- A. With regard to the hygiene practice, video counseling was better and verbal counseling was worse.
- B. Pertaining to knowledge of eye drop use, again, video demonstration on shaking of the bottle before usage was well understood and remembered by 20 patients, compared to 16 in the chart group and only 16 in the verbal group. Sixteen understood that only one drop should be instilled with each visit in the video group vs. 17 in the chart and 12 in the verbal group. Nineteen remembered to follow the instruction to open the eye drop for the first time using video, better than the chart group (only 11), and verbal instructions were not understood by most of the patients. Again, the video group better remembered to close the eyes after eye drop each time (17) compared to chart (11), and the verbal group (5) performed the worst. Similarly, the video group was the best to remember and to use eye drops before ointment, to leave 5-minute intervals between eye drops,

and to discard used eye drops after 28 days. Chart group was better and the verbal was worse.

- C. With regard to compliance, patients in both chart (20) and verbal group (20) were better and never missed applying eye drop compared to the video group (17).
- D. With relevance to the proper technique, all the groups were properly using the eye drop without touching the bottle tip [Table 3].

In all three groups, the responses to the questions regarding hygiene, compliance, and the technique of eye drop application were improving during subsequent visits compared to the first visit [Table 3 and Fig. 2].

Discussion

Patient counseling is an important part of healthcare management. Counseling of eye drop usage is a simple process of educating beneficiaries about the need for and the importance of eye drops hygiene, usage, and their care by the counselors. Due to a lack of proper and adequate understanding of the importance and method of usage of eye drops, patients end up with poor instillation, wastage of eye drops, progression of the disease, drop contaminations, and secondary infections. Glaucoma and cornea are the

Table 3: Comparison of three groups of counseling and the results using Kruskal-Wallis nonparametric test

	Visit 3	Video	Chart	Verbal	P
Q1	Every time	20	16	12	0.007
	Often	0	4	7	
	Once a week	0		1	
Q2	Every time	20	16	13	0.017
	Often	0	4	6	
	Once a week	0	0	1	
Q3	Every time	16	17	12	0.186
	Often	2	3	7	
	Once a week	0		1	
	Never	2			
Q4	Never	20	20	20	
Q5	Every time	2			0.045
	Often	1			
	Never	17	20	20	
Q6	Every time	19	11	5	0.0001
	Often	1	9	14	
	Once a week	0		1	
Q7	Every time	17	11	5	0.0003
	Often	2	9	14	
	Once a week	0	0	1	
Q8	Every time	18	12	7	0.002
	Often	2	8	12	
	Once a week	0	0	1	
Q9	Every time	18	12	7	0.002
	Often	2	8	12	
	Once a week	0	0	1	
Q10	Every time	18	12	5	0.0002
	Often	2	8	14	
	Once a week	0	0	1	

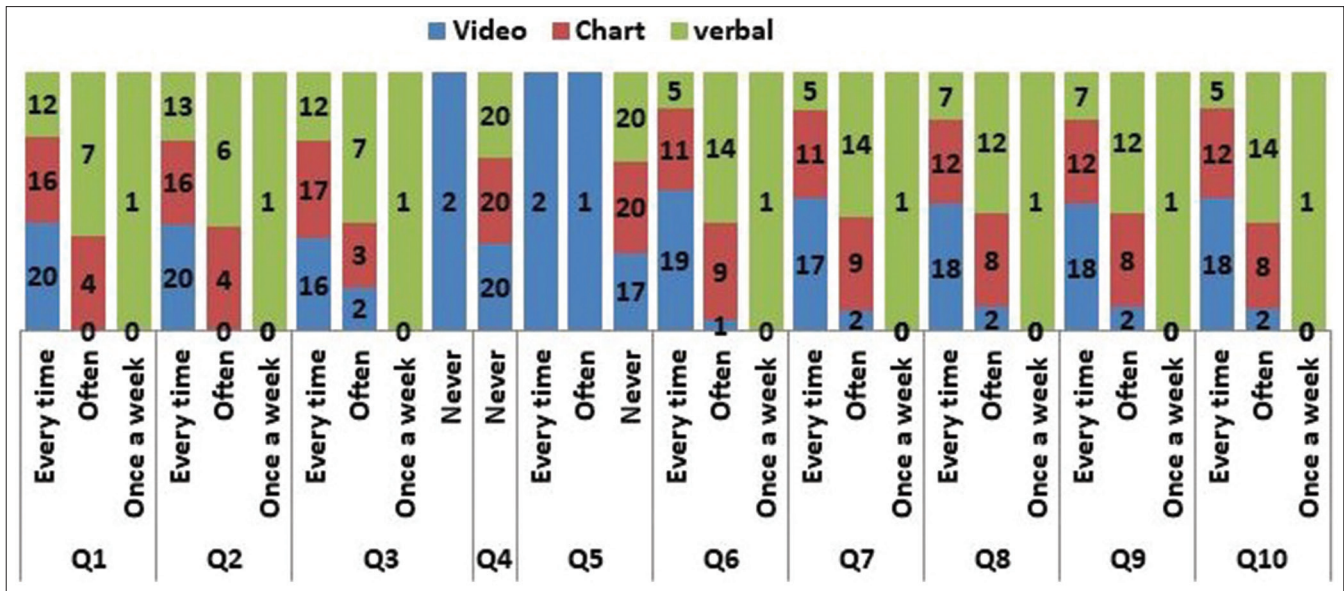


Figure 2: Graphical representation and comparison of the third-visit counseling methods

two fields of ophthalmology wherein chronic usage of eye drops are followed to slow down optic nerve damage and avoid graft rejection, respectively. Many studies have been conducted to evaluate the proper technique, compliance, and the challenges faced while self-instilling anti-glaucoma drops by patients.¹⁶⁻⁸¹ Ours is the first ophthalmic study conducted in post-keratoplasty patients to highlight the issue of compliance, proper technique and method of eye drop usage, and hygiene practice, and recommend an efficient way to improve patient understanding of eye drop administration through different communication methods for postoperative management of keratoplasty. For patients undergoing keratoplasty, the current therapy is centered on the long-term prophylaxis on reducing IOP and preventing graft rejection.

Magalhaes *et al.*¹⁰⁰ reported that effective long-term prophylaxis of topical medications and proper follow-up is essential for improving outcomes in keratoplasty, but only a small percentage of patients receive proper guidance for topical administration of medications. Crawford *et al.*¹¹¹ evaluated the extent of treatment adherence after PKP in New Zealand over a period of 10 years and found that the rate of nonattendance is higher compared to other forms of organ transplant: 57% of non-compliers experienced one or more rejection episodes compared to compliers.

Most patients apply eye drops on their own, which is another most challenging part of the therapy, leading to missing and wastage of drops, thereby affecting graft survival.^{112,13} In our study, only 18.3% of patients self-administered their eye drops and most of them had caretakers to apply eye drops (81.7%), which were comparatively higher than those reported in other studies. Sleath *et al.*¹¹⁴ observed handgrip strength as the important factor for proper drug instillation and that 44% of patients missed the eye during attempted drop application. Education is a key factor in ensuring usage of drops effectively and providing a thorough understanding of the ocular condition for which the medication has been prescribed.^{115,161} When patients realize the importance of proper eye care, especially post-surgery, and how it affects the

outcome, they will be motivated to persistently follow correct instructions. Robin *et al.*, in their review on compliance, stated that improvement in educational barriers, administration challenges, and individual variations are needed.¹⁶¹ To address these, we developed three means of common counseling methods for eye drop usage and follow-up and evaluated the best method to improve compliance of the patients.

Kholdebarin *et al.*¹¹⁷ reported that 33.8% of their 500 patients demonstrated an improper administration technique, 6.8% missed their eye, and 28.8% contaminated the bottle tip. Tatham *et al.*¹¹⁸ in his study found that 30.5% of patients touched the tip of the bottle, which can lead to possible bottle contamination and can cause ocular surface infections. Similarly, in our study, patients who forget to use topical medications were only 20% in the verbal group, 25% in the chart group, and 50% in the video group during the first visit. We noticed a reasonable improvement in the subsequent visits. Moreover, attitude toward the use of topical medications and eye drop hygiene techniques improved in all of the patients within each group.

Recently, efforts have been made to develop applications for smartphones to help glaucoma patients with monitoring their health condition as well as medication compliance. Mira *et al.*¹¹⁹ piloted a compliance app (ALICE) for elderly patients taking multiple medications. Ho *et al.*¹²⁰ looked into AV aids; other studies utilized short messaging service (SMS) reminder technology for improving medication compliance.^{115,18,191} Davis recommended a short educational video to improve the drop usage and technique, which can be shown in any provider's office or online.¹²¹ However, in our series, we tried to imprint the information in patients' minds by using visual stimuli (both video and chart methods). Feng *et al.*¹²² used a video-plus-educational hand-out and observed an improvement in average technique score from 2.53 out of 15 points at baseline to 6.15 points immediately after the statistically significant intervention. Many other authors from various other fields of medicine have reported that video intervention gives greater satisfaction and knowledge to the patients,^{121,221} but no study has compared the different methods

of counseling to improve patient education. Clear, concise, and visually appealing modes of communication in our series have helped to improve patient understanding and compliance, and the outcome was statistically significant. The limitations include that this was a subjective, questionnaire-based study not previously validated. Bias might have been introduced as postoperative patients are more vigilant about their medication use, and all information about prior instruction and source of education was based on patient recall as answered on a questionnaire. Finally, the sample size and the shorter duration of the study also limits its significance.

The only modifiable factor in preventing graft rejection is compliance to the prophylactic therapy and follow-up. Although the risk of graft rejection increases with each subsequent graft, a persistent issue of global shortage of donor corneas should also be remembered.

Conclusion

The results of this pilot study have been promising and we recommend using video and chart demonstration in addition to verbal instructions for patients to educate them about eye drop usage and safety measures to improve patient compliance with topical medications, especially in post-optical keratoplasty patients, to maintain good visual acuity in the future. Proper counseling improves the quality of service and builds confidence in patients, which in turn increases motivation in the community to receive standard eye care services. Video counseling can also prevent the spread of pandemics and would ensure safety among hospital staff.

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Conflicts of interest

There are no conflicts of interest.

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