

RESEARCH PAPER

Real-time teleophthalmology video consultation: an analysis of patient satisfaction in rural Western Australia

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Background: Teleophthalmology, particularly real-time video consultation, holds great potential in Australia and similar countries worldwide, where geography, population and medical workforce distribution make it difficult to provide specialist eye services outside of major cities. Assessment and referrals from rural optometrists are vital to the success of teleophthalmology. While there is good evidence for the efficacy of such services, there is limited evidence for patient satisfaction with video consultation.

Methods: To evaluate patient satisfaction with teleophthalmology, the current study recruited patients who underwent a video consultation with Lions Outback Vision, for a follow-up telephone-based questionnaire assessing satisfaction. Regression analysis was performed assessing which demographic features and which features of the video consultation itself were associated with highest overall satisfaction.

Results: One hundred and nine of the 137 eligible patients completed the questionnaire (79.6 per cent; 55 per cent male; mean age 64.61 years). The majority of the participants were either 'Very satisfied' (69.1 per cent) or 'Satisfied' (24.5 per cent) with the service. No one reported being either 'Dissatisfied' or 'Very dissatisfied'. Linear regression did not reveal any demographic or follow-up variables as predictive of greater total satisfaction; however, participants who were older, felt they could easily explain their medical problems to the doctor in the video consultation and believed that telemedicine enabled them to save money and time, and were more likely to report higher overall satisfaction.

Conclusion: Teleophthalmology is a promising new way to overcome barriers to the delivery of eye care services to rural and remote populations. This study demonstrates a high level of overall satisfaction with teleophthalmological video consultation and patients are accepting of this emerging consultation modality, regardless of age.

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Telemedicine is increasing in uptake, utilisation and funding across a range of specialties in Australia and internationally.^{1,2} Ophthalmology is particularly suited to telemedicine due to its high reliance on visual information for the diagnosis and management of ocular disease.³ Teleophthalmology holds great potential in Australia and in similar countries worldwide where geography, population and medical workforce distribution make it difficult to provide in-person specialist services outside of major cities.⁴

Lions Outback Vision (LOV) provides a teleophthalmological service linking patients in rural and remote Western Australia to consultant ophthalmologists based in the state capital city, Perth. This program provides a combination of store-and-forward and real-time telemedicine links, with results of ophthalmic

investigations being sent to the treating ophthalmologist prior to a real-time video consultation between doctor and patient. Referrals to the service originate from optometrists working within regional communities, with rural hospital emergency departments and general practitioners often sending patients to these optometrists for review.

The scale of distance between LOV and the rural and remote communities that it services is vast. The nearest location is 416 km from Perth and the most distant is 3,215 km (Figure 1). Traditionally ophthalmological care has been provided to patients in these areas by intermittently visiting outreach ophthalmologists or by patients making the journey to Perth for review. This can lead to long delays and high transport, productivity and personal costs.

Scientific evaluation of teleophthalmology has largely revolved around the assessment of the clinical efficacy and feasibility of the medium in its various applications.^{5–11} Limited studies have investigated patient satisfaction with real-time teleophthalmological programs and to our knowledge, no prior study has specifically focused on this as the primary outcome.^{10,12,13} As teleophthalmology is increasingly augmenting outreach visits, it is important that these services are deemed appropriate by the patients they are servicing.

METHODS

A prospective study was designed to evaluate the satisfaction of consecutive patients that underwent a real-time teleophthalmological

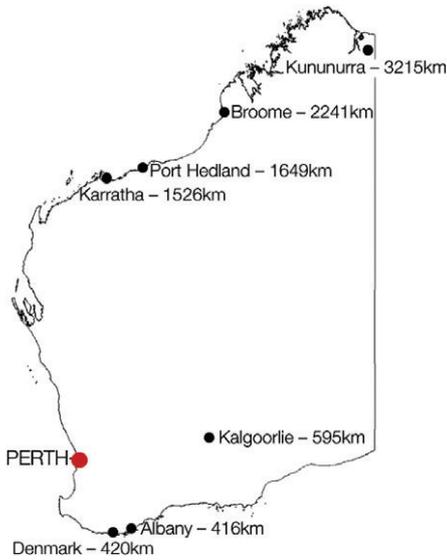


Figure 1. Map of Western Australia demonstrating video consultation sites and distance from the state capital, Perth

video consultation with LOV in a three-month period commencing 6 July 2015. Ethics approval for this project was granted by the Human Research Ethics Committee at the University of Western Australia, in accordance with requirements of the

National Statement on Ethical Conduct in Human Research (approval number RA/4/1/7591).

A researcher-administered questionnaire was adapted from the real-time telemedicine satisfaction instrument developed and validated by Fatehi and colleagues.¹⁴ The questionnaire was refined and amended to assess patient satisfaction with teleophthalmology. The revised questionnaire can be broken down into four components: demographics; overall satisfaction with the video consultation (one item, rated on a five-point Likert-scale); satisfaction with features of the video consultation (nine items, rated on a five-point Likert-scale); and qualitative items (two dichotomous and four open ended) (Table 1). Information regarding diagnosis, treatment and follow-up was obtained from participants' clinical record.

Participants

Patients over the age of 18 years who underwent a video consultation during the study period were eligible for inclusion. Participants were referred from seven different regional centres, the nearest of which was 416 km from Perth (Albany, in

the Great Southern region) and the most distant was 3,215 km from Perth (Kununurra, in the state's far north Kimberley region). The mean distance of these locations from Perth was 1,437 km (Figure 1). Referrals originated from a total of 23 individual optometrists.

Participants were contacted by a researcher independent from the consultation in the days following their video consultation and the questionnaire was administered via telephone. All prospective participants received written information regarding the research project prior to being contacted. Further information was provided at the commencement of the telephone conversation and verbal consent was obtained.

Data were logged in hard copy during administration of the questionnaire. With participants' permission, these conversations were also recorded for transcription and verification. Written records of the data were then correlated with the audio recordings to ensure the accuracy of the responses and verified by an independent researcher.

Analysis

Reliability of the core items in the scale (regarding satisfaction with features of the video consultation) was measured by estimating internal consistency (Cronbach's α) among questions 3a–3i. This was followed by regression analysis assessing:

1. which demographic features were associated with the highest total satisfaction (that is, sum of item responses for item 3a–3i) and
2. which features of the video consultation itself were associated with the highest overall satisfaction (that is, which of items 3a–3i were related to the highest scores on item 2 – 'overall satisfaction').

Statistical analysis was undertaken using SPSS (IBM Corp., Armonk, New York, USA, 2013).

RESULTS

Sample characteristics

One hundred and fifty-two video consultations (148 patients) were attempted during the study period. Nine were abandoned due to technical difficulties with the video component (resulting in telephone consultations instead). Of the

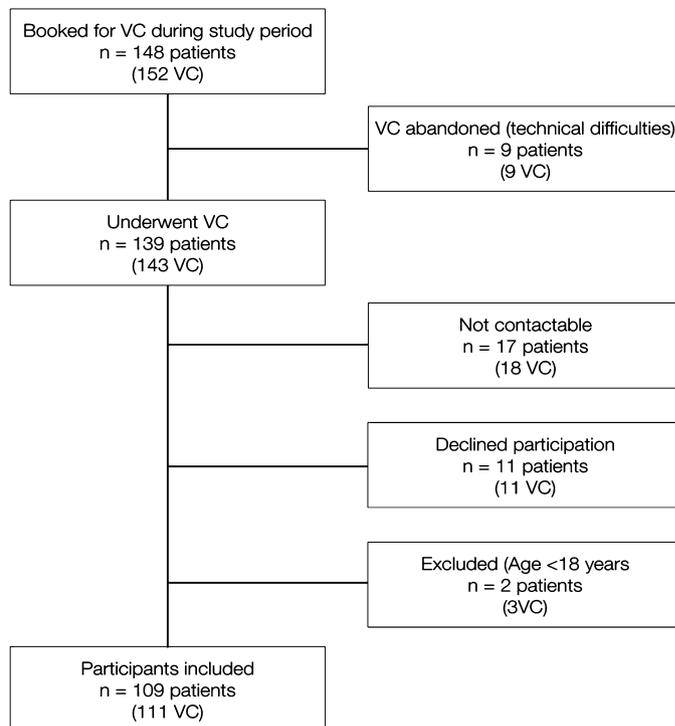


Figure 2. Flow diagram demonstrating the election of study participants

Diagnosis	Number
Disorders of lens (cataract, PCO)	50
Glaucoma	13
Disorders of choroid and retina (DR, retinal detachment, RVO, ERM, CSCR)	11
Disorders of sclera, cornea, iris and ciliary body (uveitis, dry eye, corneal scar, episcleritis, marginal keratitis)	9
Post-operative follow-up	9
Disorders of conjunctiva (pterygia)	5
Unclear diagnosis	5
Disorders of eyelid, lacrimal system and orbit (chalazion, lid lesion, thyroid orbitopathy)	3
Disorders of vitreous body and globe (PVD)	1
Disorders of optic nerve and visual pathways (NAION)	1
No pathology identified	1
Other (Horner syndrome)	1

Specific diagnoses are included, in order of frequency.
 CSCR: central serous chorioretinopathy, DR: diabetic retinopathy, ERM: epiretinal membrane, NAION: non-arteritic ischaemic optic neuritis, PCO: posterior capsular opacification, PVD: posterior vitreous detachment, RVO: retinal vein occlusion

Standard Industrial Classification 2006 codes¹⁵ and then reclassified into three groups: primary industry, professional services and out of workforce (retired, unemployed and pensioner). The majority of the sample (62.4 per cent) was outside the workforce.

Scale characteristics

The nine-item satisfaction scale (items 3a–3i; Table 3) had a scoring range of nine to 45. One item was negatively worded and was reverse scored for the purpose of calculating a total satisfaction rating. A score of nine indicates all responses were ‘strongly disagree’ and a score of 45 means all responses were ‘strongly agree’, thus higher scores indicate greater satisfaction with the video consultation. The internal consistency reliability (Cronbach’s α) associated with the scale was estimated at 0.76, which is deemed ‘adequate’ or ‘good’.¹⁶

Table 1. Primary diagnosis by ICD-10 code

139 patients that did undergo video consultation, two patients (total of three video consultations) were excluded from the study as they were under the age of 18 years. Of the 137 eligible patients, 109 completed the questionnaire (79.6 per cent), encompassing a total of 111 video consultations (79.2 per cent).

Of the 28 eligible video consultation patients that did not participate, 11 were

contacted and declined participation (including two who declined due to hearing difficulties and two who declined due to English language difficulties) and 17 were not contactable (Figure 2).

Of the 109 participants to complete the questionnaire, 60 were male (55 per cent). The mean age of the respondents was 64.61 \pm 17.60 years. The age range was from 18 years to 94 years.

Ocular conditions managed by video consultation throughout the study period were grouped into 12 different diagnostic categories (Table 1). By far the most common diagnosis was cataract (including posterior capsular opacification, n = 50), followed by glaucoma (n = 13) and retinal disorders (including diabetic retinopathy, retinal detachment and retinal vein occlusion, n = 11). Video consultation was also employed after cataract surgery.

Participant management plan following video consultation is described in Table 2. Following video consultation, the most common management was referral for cataract surgery (n = 45). Additionally, adjustments to medical therapy were made (n = 20), further investigations were arranged (n = 14) and no intervention was made when appropriate (n = 14).

Participant occupations were coded using the Australian and New Zealand

Patient satisfaction with the video consultation

Participants’ responses to the core items regarding satisfaction with features of the video consultation are summarised in Table 4. The mean total satisfaction rating was 40.11 \pm 3.76 with a minimum rating of 31 (three per cent of the sample) and a maximum rating of 45 (that is, the highest possible score; 17.4 per cent of the sample). Of the 109 participants, a total of 76 (69.1 per cent) stated that overall (that is, item 2), they were ‘Very satisfied’ with the service, 27 participants (24.5 per cent) stated that they were ‘Satisfied’ with the service and five participants (5.5 per cent) reported their satisfaction as ‘Neutral’. No one reported being either ‘Dissatisfied’ or ‘Very dissatisfied’. Due to small numbers, ‘Neutral’ responders were grouped with the ‘Satisfied’ responders for all further analyses (hereafter ‘satisfied/neutral’).

Regression analysis

We first sought to ascertain whether any participant demographic features of the sample impacted upon total satisfaction. Using linear regression with backwards model selection the following variables were entered: age, sex, previous video consultation, type of intervention, type of follow up and location of follow up. Based on this model, none of the variables measured

Management plan	Number
Cataract surgery	45
Medication prescribed/adjusted	20
Further investigation required	14
Nil intervention	14
Intravitreal anti-VEGF therapy	5
Pterygium surgery	4
YAG capsulotomy	3
Serial review	2
Retinal surgery	1
Excision biopsy	1

VEGF: vascular endothelial growth factor, YAG: yttrium aluminium garnet (laser)

Table 2. Patient management plan following video consultation

	Item number	Question	Question type
Demographic	1	Age? Sex? Location? Occupation? Have you used telemedicine for ophthalmology video consultation before?	Open ended Yes / No
Overall satisfaction	2	Overall, how satisfied were you with your telemedicine video consultation? 1. Very dissatisfied, 2. Dissatisfied, 3. Neutral, 4. Satisfied, 5. Very satisfied	Likert scale
Satisfaction with features of video consultation (core items)	3	Please answer one of the five options for the following (a to i): 1. Strongly disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly agree	
	3a	I was satisfied with the quality of the picture (video) during the video consultation.	Likert scale
	3b	I was satisfied with the quality of the sound (audio) during the video consultation.	Likert scale
	3c	The video consultation made me feel nervous and uncomfortable.	Likert scale
	3d	I could easily explain my medical problems to the doctor in the video consultation.	Likert scale
	3e	I believe the doctor understood my eye health situation during the video consultation.	Likert scale
	3f	I was confident that the doctor could provide an appropriate management plan via video consultation.	Likert scale
	3g	Telemedicine enables me to save money and time.	Likert scale
	3h	Telemedicine improves my access to medical specialist care.	Likert scale
	3i	I would like to use telemedicine again in the future.	Likert scale
Qualitative analysis	4	What was the reason for your telemedicine video consultation?	Open ended
	5	What was the outcome or treatment from your telemedicine video consultation?	Open ended
	6	Did you experience any technical difficulties during the video consultation?	Yes / No
	7	Do you think that the lack of physical contact in a video consultation is a problem for managing your eye health?	Yes / No
	8	How did this video consultation compare to a face-to-face consultation?	Open ended
	9	Do you have any comments or suggestions about this telemedicine eye service?	Open ended

Table 3. Researcher-administered questionnaire assessing patient satisfaction with teleophthalmological video consultation

were predictive of greater total satisfaction; however, it is worth noting that given the sample size, this analysis was underpowered and a larger sample may help to clarify

which, if any, of these variables are related to satisfaction with the video consultation.

Univariate and multivariate binary logistic regressions were then used to analyse

which features of the video consultation and participant age and gender, were associated with overall satisfaction ratings. Backwards model selection was used where variables significant at the five per cent level were retained for the final model. Odds ratios (OR), 95 per cent confidence intervals (CI) and p-values for the final model are provided in Table 5. Those participants who were older, felt they could easily explain their medical problems to the doctor in the video consultation, and believed that telemedicine enables them to save money and time, were more likely to report that they were very satisfied overall.

DISCUSSION

This study demonstrates that there is a high level of overall satisfaction with teleophthalmological video consultation, with a total of 94 per cent of participants reporting they were ‘Satisfied’ or ‘Very satisfied’. In addition, no participants reported being dissatisfied. Given that past research has helped to establish the efficacy of teleophthalmological programs, current findings of high participant satisfaction suggest that teleophthalmology is indeed a viable alternative to face-to-face consultation for patients in rural areas. Typical of the sentiments expressed by participants was that the video consultation experience was, ‘... just like you’re in the same room as the doctor’ and ‘...it virtually was face-to-face because I’m talking to him [the consultant] on Skype, so it was face-to-face’.

Despite demonstrating an overall very high satisfaction rating, we sought to understand how teleophthalmological services could be improved by establishing which features of the teleophthalmological consultation were most related to high overall reported satisfaction. It was found that increasing age, being easily able to explain medical problems to the doctor and the perception that the service saved the participant time and money, best predicted overall satisfaction with the video consultation.

There was a positive relationship between greater participant age, and greater satisfaction with the video consultation. This may seem a counterintuitive finding, as one might expect that older people might be less comfortable with newer technologies and prefer be seen face-to-face. This is a particularly notable

Question number	Satisfied or neutral (n = 33)					Very satisfied (n = 76)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
3a	1	1	4	18	9		1	4	22	49
3b		1	2	18	12			1	23	52
3c*	12	13	5	3		36	34	2	4	
3d	2	1	4	20	6			3	33	40
3e			3	16	14			1	21	54
3f	1	2	5	15	10				24	52
3g	1	2	5	13	12			4	14	58
3h		1	4	15	13			1	19	56
3i	1		3	19	10			1	20	55

Data are the number of responses in each category.
*Indicates negatively worded question.

Table 4. Survey results for core items (3a to 3i) grouped by ‘overall’ satisfaction rating (Item 2)

finding given that the mean age of the overall sample was high, with 43.1 per cent of the sample over the age of 70 years and the oldest participant being 94 years. It is unclear why increasing age is associated with higher levels of satisfaction, although this is a promising finding as older age may make it even more difficult for rural people to travel long distances for consultations and teleophthalmology offers a feasible and well-received alternative for these people.

It seems intuitive that ease of explaining medical problems is related to higher levels of satisfaction. Indeed, this is likely to be the case in a face-to-face consultation as well. It suggests that it is of the utmost importance that the clinician has sound communication skills and works to ensure

good rapport with the patient. For some participants, the familiarity and support provided by their local optometrist and the practice’s receptionist were also very comforting during the video consultation, as described by the following participant: ‘*I was quite familiar and comfortable with ... the people involved and so not having him (the consultant) in the same room was OK but if he (the consultant) was a total stranger and I had never spoken to him before and I didn’t have any help with the technology then I think that would have been a worry to me*’.

This highlights the fact that the participants’ levels of comfort may also be dependent on the specialist conducting the video consultation (and the other clinicians involved), rather than the modality of the

consultation itself. Since 98.7 per cent of video consultations in this study were completed by the same ophthalmologist, it was not possible to explore the relationship between participant satisfaction and individual clinicians; however, as there is increasing uptake of teleophthalmology, future research should endeavour to evaluate variation in satisfaction related to clinicians.

Those participants who perceived that teleophthalmology saved them time and money were more likely to have higher levels of overall satisfaction. It is likely that the financial benefit extends not only to the patients and their health outcomes but also the clinicians and wider community.¹⁷ Eliminating the costs associated with travelling to an urban centre to receive ophthalmological care removes a significant barrier to seeking care. This may also further improve patient access and follow up. Feedback from participants indicated that they were willing to overcome any initial reluctance to telemedicine if it enabled them to be seen by a specialist more quickly, hence, ‘*I would have preferred a face-to-face but ... I was going to have to wait until he (the specialist) came down next time so I was quite happy with the whole telehealth thing*’.

Despite the very high levels of satisfaction, this study illustrates that teleophthalmology is not necessarily appropriate for all people. Four eligible patients declined the telephone questionnaire due to hearing and/or language difficulties. It seems probable that this small group is most at risk of difficult and impaired communication with the

	Significance	OR	95% CI for OR	
3a - I was satisfied with the quality of the picture (video) during the video consultation.	0.105	1.82	0.88	3.76
3d - I could easily explain my medical problems to the doctor in the video consultation.	0.005	4.19	1.54	11.41
3f - I was confident that the doctor could provide an appropriate management plan via video consultation.	0.096	2.23	0.87	5.75
3g - Telemedicine enables me to save money and time.	<0.001	4.01	1.84	8.74
Age	0.026	1.03	1.00	1.06

Variables entered at Step 1: Age (continuous), sex, 3a, 3b, 3c, 3d, 3e, 3f, 3g, 3h, 3i (Table 1).
CI: confidence interval, OR: odds ratio

Table 5. Univariate and multivariate binary logistic regression model

ophthalmologist during the video consultation itself. Therefore, it would be useful to have satisfaction data from these patients. It would be beneficial for future studies to find another method to capture the perception of teleophthalmology in those who are unable to participate.

The geographic and demographic landscape of Australia, coupled with ongoing improvements to affordable technology, internet access and government investment, means that teleophthalmology is a promising new way to overcome barriers to the delivery of eye-care services to rural and remote populations. The involvement of optometrists is key to this success. Past research has already established the efficacy of teleophthalmology for various applications. Analysis from this study indicates that patients are accepting of this emerging consultation modality and are overwhelmingly satisfied with the service provided.

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