J Telemed Telecare OnlineFirst, published on July 20, 2016 as doi:10.1177/1357633X16660640

RESEARCH/Original Article

Journal of Telemedicine and Telecare
0(0) 1–10

DOI: 10.1177/1357633X16660640
jtt.sagepub.com
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Real-time teleophthalmology versus face-to-face consultation: A systematic review

Irene J Tan[1], Lucy P Dobson[1], Stephen Bartnik[1,2], Josephine Muir[1,3] and Angus W Turner[1,3]

Abstract

Introduction: Advances in imaging capabilities and the evolution of real-time teleophthalmology have the potential to provide increased coverage to areas with limited ophthalmology services. However, there is limited research assessing the diagnostic accuracy of face-to-face teleophthalmology consultation. This systematic review aims to determine if real-time teleophthalmology provides comparable accuracy to face-to-face consultation for the diagnosis of common eye health conditions.
Methods: A search of PubMed, Embase, Medline and Cochrane databases and manual citation review was conducted on 6 February and 7 April 2016. Included studies involved real-time telemedicine in the field of ophthalmology or optometry, and assessed diagnostic accuracy against gold-standard face-to-face consultation. The revised quality assessment of diagnostic accuracy studies (QUADAS-2) tool assessed risk of bias.
Results: Twelve studies were included, with participants ranging from four to 89 years old. A broad number of conditions were assessed and include corneal and retinal pathologies, strabismus, oculoplastics and post-operative review. Quality assessment identified a high or unclear risk of bias in patient selection (75%) due to an undisclosed recruitment processes. The index test showed high risk of bias in the included studies, due to the varied interpretation and conduct of real-time teleophthalmology methods. Reference standard risk was overall low (75%), as was the risk due to flow and timing (75%).
Conclusion: In terms of diagnostic accuracy, real-time teleophthalmology was considered superior to face-to-face consultation in one study and comparable in six studies. Store-and-forward image transmission coupled with real-time videoconferencing is a suitable alternative to overcome poor internet transmission speeds.

Keywords

Remote consultation, teleconsulting, telemedicine, teleophthalmology

Date received: 10 May 2016; Date accepted: 29 June 2016

Introduction

Telemedicine is defined as the use of information and communication technologies to provide health care services to patients from a distance.[1] A major area of application of this system has been in the field of ophthalmology, with the first project published in 1975.[2] Since then, advancements in imaging capabilities and technologies have seen the integration of telemedicine into clinical practice.

Asynchronous, or store-and-forward, teleophthalmology relies on the capturing of clinical information and images, and evaluation of this information by an off-site clinician. The clinician makes a diagnosis and formulates a management plan, relaying this information to the referrer at a later time. Diabetic retinopathy screening is perhaps the best example of this teleconsultation, with multiple screening programmes currently in use worldwide.[3–10]

Synchronous, or real-time, teleophthalmology is an emerging application, whereby a real-time connection between the clinician and the referrer is established. Real-time teleophthalmology attempts to more closely mimic a traditional face-to-face consultation. It allows the clinician to explore additional history or examination findings and enables dialogue between the clinician, referrer and/or patient.

Multiple studies have evaluated the accuracy,[11–20] reliability,[11,13,15,19,21,22] cost-effectiveness[23–35] and level of patient satisfaction[7,36,37] in asynchronous teleophthalmology. Although asynchronous teleophthalmology has been

[1]Lions Outback Vision, Lions Eye Institute, Australia
[2]Sydney School of Public Health, University of Sydney, Australia
[3]Centre for Ophthalmology and Visual Science, University of Western Australia, Australia

Corresponding author:
Irene J Tan, Lions Outback Vision, Lions Eye Institute, 2 Verdun St, Nedlands, Western Australia, 6009, Australia.
Email: irenetan@lei.org.au

successfully applied to diabetic retinopathy, its utility is largely restricted in a screening capacity. In contrast, real-time teleophthalmology is focused on the diagnosis, management and therapeutic relationship between an ophthalmologist and a patient, and is less well studied.

The aim of this systematic review is to determine whether real-time teleophthalmology provides comparable accuracy to face-to-face consultation for the diagnosis and recommended treatment of common eye health conditions. Studies involving synchronous teleconsultation are logistically difficult to design in a real-world setting, and thus we endeavour to assess the quality of research in this field to answer our review question.

Methods

Search strategy

We searched the electronic databases of PubMed, Embase (OVID interface), Cochrane and Medline (OVID interface) for studies that compared real-time teleophthalmology with face-to-face consultation. We did this by constructing our search strategy (Table 1) based on medical subject headings and text terms. The search was conducted on 6 February 2016 and repeated on 7 April 2016. One reviewer scanned references of eligible studies to identify further relevant texts not retrieved by database search. The search strategy was not restricted by time or language.

Literature search results were then uploaded into Endnote X7 (Thomson Reuters, USA), an electronic reference management software. Duplicates were first identified using this software and reviewers then manually searched the existing list to identify further duplications with different citations. The latter were compared by author names, year and journal of publication, methods and results in the abstract, prior to extraction.

Eligibility criteria

Studies were included applying the following criteria: (a) employed an element of real-time telemedicine (video or audio); (b) conducted in an ophthalmology or optometry environment and (c) compared the diagnostic accuracy and efficacy of a real-time teleophthalmology method against a face-to-face consultation.

Table 1. Search strategy.

Search	Syntax
1	((Telemedicine OR Telehealth OR remote consultation OR tele OR ehealth OR emedicine OR video conferencing OR teleconsultation) AND (ophthalmology OR optometry)) OR (teleophthalmology OR teleoptometry)

Studies were excluded if the telemedicine technology employed store-and-forward methods only and/or if animal subjects were used. Reasonable attempts were carried out to source abstracts and full texts missing from the initial search citations. These attempts included requests through library sources, contact with editorial staff of relevant journals and in one case direct contact with the author. However, inability to source the full text resulted in exclusion of the study.

Study selection

Two reviewers (IT and LD) independently examined titles and abstracts from the database search. Studies were selected for inclusion based on the eligibility criteria. Abstracts with ambiguity in either the method of teleophthalmology utilised or comparison to face-to-face consultation were included for further full text review. Reviewers compared a selection of full texts for review and conflicts around inclusion were resolved by consensus discussion. An independent full text review with application of the eligibility criteria was carried out by the third reviewer (SB). The final studies for inclusion were compared and conflicts were again resolved by consensus discussion.

Data collection and quality assessment

Full texts were reviewed and data extracted onto a form to highlight characteristics of each study. Extraction was performed by one reviewer and verified by a second reviewer. The information for data extraction included: year of publication; location; sample size; eyes tested; age of subjects; diseases identified; descriptor of index test; descriptor of reference standard; examiner qualification; outcomes measured; statistical outcome (if relevant); overall outcome of study indicating a preference to method (real-time versus face-to-face) and video/image size and transmission format.

The revised tool for the quality assessment of diagnostic accuracy studies (QUADAS-2) was applied to the included studies to assess the risk of bias and applicability to our review question.[38] The reference standard test in our review is classified as face-to-face consultation with an ophthalmologist. Reviewers customised signalling questions of the QUADAS-2 tool for assessment of risk of bias. Following customisation and trialling of the QUADAS-2 tool, the two reviewers (IT and LD) independently applied the tool to the selected studies. Where there was discrepancy in the results of the tool between reviewers, a third independent reviewer (SB) was recruited as an arbitrator.

Data synthesis and analysis

The characteristics of the studies and quality analysis are presented in tables and text to aid the presentation of the systematic narrative synthesis. The review retains studies with any level of bias in analysis, shown in tables recommended by the QUADAS-2 tool, and discussions of the principal outcomes of interest occur through text.

Results

The database search yielded 627 reference results (after duplicate extraction) and, of these, 12 studies were included in the final assessment of quality via application of the QUADAS-2 tool. Figure 1 represents the application of the preferred reporting items for systematic reviews and meta-analysis (PRISMA).[39]

Study characteristics of included studies

Publication dates spanned from 1997 to 2015. The studies were conducted in Asia-Pacific ($n = 4$), North America ($n = 4$), the United Kingdom ($n = 3$) and Europe ($n = 1$). Five of the studies[40–44] specified ages of participants, with an inclusive range from four years to 89 years. Ocular conditions evaluated were diverse and covered corneal and retinal pathologies, strabismus, oculoplastics and post-operative review. Four of the included studies evaluated non-selected general ophthalmology presentations.[22,40,45,46] Study characteristics and the description of their real-time method are summarised in Table 2.

Real-time teleophthalmology techniques varied greatly between the studies. These can be categorised into widely available basic videoconferencing equipment combined with store-and-forward image transmission, intermediate telehealth technology utilising a real-time video feed from examination equipment, and advanced teleophthalmology technology. Three studies utilised basic videoconferencing technology,[40,42,45] and intermediate-level technology was utilised in eight studies which included live-feed from a slit-lamp[22,44,46–49] or direct ophthalmoscope.[43] Two studies assessed innovative advanced teleophthalmology technology. Tanabe et al.[50] studied a novel remote operated slitlamp system and Tan et al.[41] utilised an integrated software package which displayed a shared electronic whiteboard to manipulate images and video between the ophthalmologist and patient. Methods of image and video transmission for the teleophthalmology component were not explicitly stated in all studies, but those that did showed variation in transmission speed, with 384kbits per second as the most commonly used

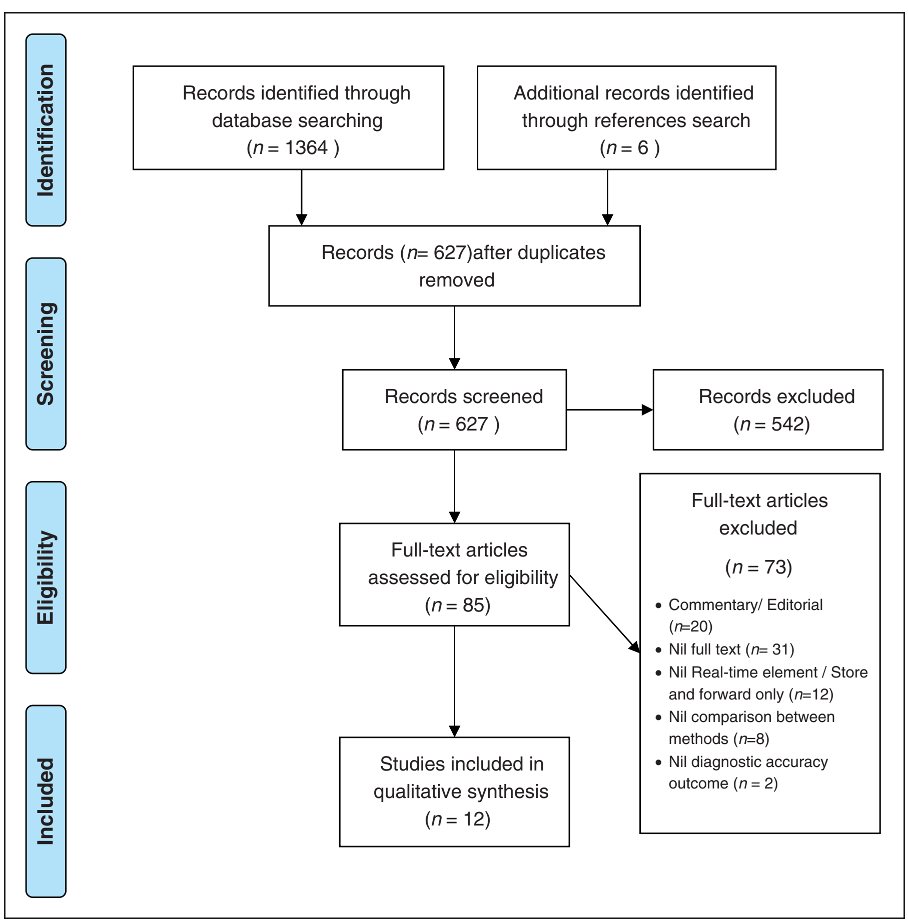

Figure 1. PRISMA representation of study selection.

Table 2. Study characteristics.

Author	Sample size (patient/ eyes)	Age range	Eye conditions	Real-time method	Transmission
Bar-Sela and Glovinsky, 2007[45]	49 (98)	NS	Complicated emergency room presentations	Store-and-forward with real-time audio conference	Images = 200 kB JPEG Video clips = 700 kB/sec MPEG-2 Transmission = ADSL; 0.1 Mbit/sec and 1.5Mbit/ sec respectively
Hagman et al., 2004[40]	22 (NS)	7–82 years	General conditions	Real-time VC. Two VC units	Images = wavelet compression Video = 25 frames/Sec Transmission = LAN
Tan et al., 2013[41]	30 (30)	21–75 years	Chronic blurred vision including: maculopathy; media opacity; optic neuropathy and keratopathy	Combination store-and-forward with real-time VC	NS
Tanabe et al., 2011[50]	29 (NS)	NS	Cataract surgery Trabeculectomy Vitrectomy Scleral buckling Retinal detachment	Real-time VC with novel remote slitlamp	Digital video transport system = non-compressed 30 frames/sec. 30 Mbit/sec
Nitzkin et al., 1997[22]	6 (NS)	NS	General	Combination store-and-forward with real-time VC	NS
Cheung et al., 2000[42]	85 (NS)	4–66 years	Paediatric strabismus	Real-time VC	Video transmission = 224 kbit/sec. 30 frames/sec
Marcus et al., 1998[43]	37 (73)	25–65 years HIV 32–66 years DM	HIV – retinopathy vs CMV DM – CSMO, NPDR, PDR Optic nerve changes Cataracts	Real-time video of direct ophthalmoscopy. Monitoring and viewing ophthalmologist in same room as patient	Video transmission = 1.5 MBit/sec
Peter et al., 2006[48]	NS (48)	NS	Diabetic macula oedema CSMO	Real-time video slitlamp and VC	Video and image transmission = ISDN 128 kbit/sec per line. Up to 348 kbit/sec
Bremner et al., 2002[49]	6 (NS)	NS	Neuro-ophthalmology clinic patients	Resident and ophthalmologist real-time video slitlamp and VC	Video transmission = 384kbit/sec
Rayner et al., 2001 [47]	17 (NS)	NS	Adnexal conditions – congenital and aponeurotic ptosis Lid swellings, basal cell carcinoma, phthiscal eye	Real-time VC with video slitlamp and digital camera	Video transmission = ISDN 384kbit/sec. 30 frames/sec
Dawson et al., 2002[44]	30 (NS)	20–89 years	Strabismus	Real-time VC with video slitlamp and digital camera	Video transmission = 384kbit/Sec ISDN. 30 frames/sec
Threlkeld et al., 1999[46]	25 (50)	NS	Ocular adnexa and anterior segment	Real-time video slitlamp controlled by non-ophthalmologist	Video transmission = 1.544M-bit/s

NS: not specified; VC: video conference; HIV: human immunodeficiency virus; DM: diabetes mellitus; CSMO: clinically significant macula oedema; NPDR: nonproliferative diabetic maculopathy; PDR: proliferative diabetic maculopathy; CMV: cytomegalovirus; ADSL: asymmetric digital prescriber line; ISDN: integrated services digital network; LAN: local area network; kB: kilobyte; kbit: kilobit; Mbit: Megabit.

transmission[44,47–49] and the fastest transmission at 1.5Mbit per second.[43,45,46]

All included studies assessed the outcomes from examinations conducted by consultant ophthalmologists, excluding a sub-study within Marcus et al.[43] whereby third year ophthalmology residents reviewed a live direct ophthalmoscopy video feed operated by a primary care physician. There was greater variation in the ophthalmology skills of the operator co-located with the patient in the telemedicine arm. The onsite operator was an ophthalmologist or ophthalmology fellow in one study,[48] ophthalmology resident in four studies,[40,45,47,49] ophthalmic technician or orthoptist in three studies,[41,42,44] and other health care professionals or unstated assistants in four studies.[22,43,46,50]

In terms of overall diagnostic accuracy, real-time teleophthalmology was considered superior to face-to-face consultation in one study[41] and was comparable in six studies.[40,42–45,47] Results for each study are reported in Table 3.

Quality of included studies

The risk of bias in patient selection was high in 33% of studies and 42% were considered unclear. This was due to limited information regarding the patient recruitment process or patient selection within the methods of the published studies.

For the index test, 33% were judged to be at high risk of bias and 8% were considered unclear. The main concern around the index test assessment was the variability of the index test methods amongst studies. These were often novel and the subsequent interpretation or conduct by the researcher of the index test was associated with high risk of bias.

In the reference standard domain, the risk of bias was high in 25% of cases and low in 75%. Such a result reveals that the majority of the studies conducted a reference standard examination by a clinician at an appropriately trained level (ophthalmologist) and the results of the reference test were interpreted without the knowledge of the index test.

The domain of flow and timing also had 25% of the studies at high risk. This was because the timing between the reference and index test was not appropriate, particularly in studies with minutes or days between each test with the same examiner.[22,45,50] In addition to this, the unnecessary exclusion of patients from data analysis had the potential to introduce bias.[41]

The overall applicability of the domains (patient selection, index test and reference standard) was of low concern. Nitzkin et al.[22] was the only study to raise some concern around the applicability of patient selection. This was due to the unclear nature of patient selection in the study and thus the selection not matching the review question. Table 4 represents a summary analysis of the quality assessment, QUADAS-2 tool results.

Discussion

Summary of evidence

Overall, the diagnostic accuracy of teleophthalmology is comparable to face-to-face consultation but has some limitations. The efficacy of diagnostic accuracy is affected by the quality of information provided to the clinician, particularly for live video-feed examination. In the face of an increasingly strained health system, it is important to redesign service delivery to maximise utilisation of resources currently available. Real-time teleophthalmology has the potential to reduce the economic costs and service coverage limitations currently seen in the traditional consultation setting. There may be large initial costs associated with installing the information technology required for effective teleconsultation. However, studies utilising basic videoconferencing technology alone, such as in Rayner et al.[47] and Dawson et al.,[44] had similar overall diagnostic accuracy outcomes favouring telehealth when compared to studies with more advanced teleophthalmology equipment.[41,50] This highlights that effective teleconsultation is possible with technology currently widely available to health practitioners in remote and rural locations. The effectiveness of this interaction, however, is largely dependent on internet transmission speed, particularly when required for remote examination. In this instance, a hybrid of asynchronous image transmission paired with real-time consultation overcomes this limitation.

Limitations

On reviewing the QUADAS tool results, we note that the largest source of bias is in the selection of patients. In more than half of studies there was limited disclosure on the process of recruiting study participants, thereby increasing the selective bias to patients who would perform well for the telehealth consultation.

The greatest limitation of this review was the lack of consistent outcome measures across various study designs. Our study question was aimed at an overview of real-time teleophthalmology in its multiple applications, which accordingly included a range of studies with different methods and measured outcomes. As a consequence, each study reported findings using various statistics, from specificity and sensitivities,[41,43,46,48] to self-determined feasibility scores[45] and subjective assessment.[49] Our study conclusions are therefore based on the performance of outcome measures specific to each report, with pooled specificity and sensitivity information limited to the four studies in which this statistical measure was reported.

A second limitation of our study was the difficulty in accessing full texts of references accepted based on title and/or abstract information. The reviewers utilised library document request facilities and contacting journals and authors directly; however, success was low. This was likely due to the age of the publication and the majority

Table 3. Study results.

Author	Study design	Eye conditions	Telehealth	Reference standard	Real-time telehealth or face-to-face outcome
Bar-Sela and Glovinsky, 2007[45]	Feasibility	Ocular surface Anterior chamber Anterior chamber angle Pupils Lens Posterior pole inc. optic nerve head Macula	Feasibility mean scores (range): 89 (70–100) 87 (80–90) 95 (90–100) 90 86 (80–95) 90 85(80–90)	Agreement in diagnosis for all cases seen with telehealth. Nil statistical analysis.	Comparable
Hagman et al., 2004[40]	Feasibility	General conditions	Clinician preference for real-time video equipment in percentage Sony SLC-VL10 29% Tandberg image 9% Sony = Tandberg 62%	NS	Comparable Current technology seems sufficient for real-time telehealth
Tan et al., 2013[41]	Prospective study	Chronic blurred vision: Visually significant media opacity Maculopathy Optic neuropathy, any type Keratopathy	Sensitivity 96%; specificity 100% Sensitivity 100%; specificity 100% Sensitivity 100%; specificity 92% Sensitivity 100%; specificity 100%	NA	Telemedicine
Tanabe et al., 2011[50]	NS	Cataract surgery Trabeculectomy Vitrectomy Scleral buckling Retinal detachment	NS	NS	Conventional slitlamp
Nitzkin et al., 1997[22]	NS	General	Kappa coefficient Group 1 – 0.61 Group 2 – 0.75	NS	Reliability of telemedicine compared to face-to-face improves with experience in ophthalmic examination
Cheung et al., 2000[42]	Prospective inter-observer agreement studies	Paediatric strabismus category: Horizontal 6 m and 0.33 m fixation Vertical 6 m and 0.33 fixation Angle of deviation: Horizontal 6 m and 0.33 m fixation Vertical 6 m and 0.33 fixation	Intraclass correlation coefficient (kappa) 0.66; 0.74 (good) 0.28; 0.25 (poor) 0.79;0.70 (good) 0.78;0.65 (good)	0.79; 0.69 (good) 0.83; 0.91 (excellent) 0.91; 0.92 (excellent) 0.87; 0.90 (excellent)	Comparable

(continued)

Table 3. Continued

Author	Study design	Eye conditions	Telehealth	Reference standard	Real-time telehealth or face-to-face outcome
Marcus et al., 1998[43]	Prospective comparative case series	HIV retinopathy DM – CSMO, NPDR, PDR DM – optic nerve changes DM – cataracts	Sensitivity 83.3%; specificity 95.2% Sensitivity 29%; specificity 100% Sensitivity 50%; specificity 100% Sensitivity 41%; specificity 100%	100% of telehealth for HIV retinopathy diagnosis = face-to-face diagnosis without cataract	Comparable in HIV Not comparable in DM, particularly in those with media opacity
Peter et al., 2006[48]	Prospective pilot study	Diabetic macula oedema + CSMO	Sensitivity 38%; specificity 95% (Note: store-and-forward photographs sensitivity 75%; specificity 95%)	NA	Face-to-face
Bremner et al., 2002[49]	NS	Neuro-ophthalmology clinic patients	NS	NS	Face-to-face
Rayner et al., 2001[47]	NS	Adnexal conditions – congenital and aponeurotic ptosis Lid swellings, basal cell carcinoma, phthiscal eye	18% of cases had errors in diagnosis and management 58% of cases had full agreement 24% similar diagnosis with different treatment plan		Comparable for specific adnexal conditions – untreated congenital and aponeurotic ptosis
Dawson et al., 2002[44]	NS	Strabismus	80% full agreement in diagnosis and management 3.3% partial agreement 16.6% nil agreement		Comparable for manifest strabismus Telehealth inferior for latent strabismus and micro-movements or non-compliant patients
Threlkeld et al., 1999[46]	NS	Eyelid mass Conjunctival pigment Posterior synechiae Blepharitis Iridotomy Pinguecula Iris lesion Corneal scar Chamber inflammation Nuclear cataract IOL Cortical cataract Vitreous in chamber Chalazion Keratitis Follicles/papillae	Sensitivity 100%; specificity 64% Sensitivity 100%; specificity 85% Sensitivity 100%; specificity100% Sensitivity 80%; specificity 0% Sensitivity 83%; specificity 93% Sensitivity 70%; specificity 93% Sensitivity 75%; specificity 93% Sensitivity 56%; specificity 98% Sensitivity 0%; specificity 100% Sensitivity 57%; specificity 93% Sensitivity 37%; specificity 100% Sensitivity 100%; specificity 91% Sensitivity 0%; specificity 100% Sensitivity 0%; specificity 100% Sensitivity 0%; specificity 100% Sensitivity 0%; specificity 94%	NA	Face-to-face

NA: not applicable; NS: not specified; HIV: human immunodeficiency virus; DM: diabetes mellitus; CSMO: clinically significant macula oedema; NPDR: nonproliferative diabetic maculopathy; PDR: proliferative diabetic maculopathy; IOL: intraocular lens

Table 4. QUADAS-2 results.

	Risk of bias				Applicability concerns		
Study	Patient selection	Index test	Reference standard	Flow & timing	Patient selection	Index test	Reference standard
Bar-Sela and Glovinsky, 2007[45]	L	L	L	H	L	L	L
Hagman et al., 2004[40]	L	L	H	L	L	L	L
Tan et al., 2013[41]	H	L	L	H	L	L	L
Tanabe et al., 2011[50]	H	H	H	L	L	L	L
Nitzkin et al., 1997[22]	U	H	H	H	U	L	L
Cheung et al., 2000[42]	L	L	L	L	L	L	L
Marcus et al., 1998[43]	H	H	L	L	L	L	L
Peter et al., 2006[48]	H	L	L	L	L	L	L
Bremner et al., 2002[49]	U	L	L	L	L	L	L
Rayner et al., 2001[47]	U	L	L	L	L	L	L
Dawson et al., 2002[44]	U	U	L	L	L	L	L
Threlkeld et al., 1999[46]	U	H	L	L	L	L	L

L: low risk; H: high risk; U: unclear risk

of these references having been published in magazines rather than journals. It is expected that the inclusion of these references would not have influenced our findings as they would be excluded on the absence of face-to-face reference consultation. Overall, the conclusions of this review are restricted by the lack of research in real-time teleophthalmology and the methodological and quality variation between projects.

Studies on the accuracy of real-time teleconsultation are widespread across medical and surgical disciplines including dermatology,[51–53] neurology,[54–56] psychiatry,[57–59] otolaryngology,[60] neurosurgery,[61] rheumatology,[62] oncology[63] and burns.[64] Outcomes of these studies have shown lower accuracy in real-time telehealth consultations compared to face-to-face consultations; however, there is future promise with further technological developments.

Psychiatric assessment using telephone consultation and videoconferencing has been found to be agreeable to face-to-face consultation, as by nature this assessment is less reliant on the video transmission quality.[58] However, in oncology telehealth, diagnosis of malignant breast lesions requires physical examination and as such it was noted that diagnostic accuracy for carcinoma was lower than benign breast conditions when conducted through telephone consultation.[57]

Improvements in accuracy and confidence in real-time teleconsultation is variable across the disciplines; however, there are examples of improvement in teledermatology, neurology and neurosurgical teleconsultations. Teledermatology studies suggest a hybrid of live interactive consultations combined with store-and-forward imaging as a method of improving accuracy,[65] which reflects the findings of our review in ophthalmology. Neurosurgical and neurological teleconsultation has indicated that diagnostic accuracy is highly dependent on the experience of the referring physician; however, advances in teleradiology assisted in improving diagnostic confidence.[54,55,61] Despite the lack of research specifically in real-time ophthalmology consultations, the experiences in other disciplines have the potential to be applied to real-time teleophthalmology and may provide valuable lessons to improve the real-world application.

Conclusion

In terms of the application of this review to clinical practice, we note that teleophthalmology is successful at detecting gross changes, while subtle changes are determined by the quality of imaging. The difficulty in determining the overall diagnostic accuracy of real-time teleophthalmology is the range of conditions which we have included in this review. In order to determine whether the performance of a test, in this case real-time teleophthalmology, is sufficiently accurate for diagnosis, consideration must be given to the implications of a false positive or false negative result. If the consequence of a false negative result is serious, a test should have high sensitivity. Similarly, in diseases with low prevalence, a high specificity would be desirable.[66] It must be remembered, however, that sensitivity and specificity values oversimplify teleconsultation, which is not a diagnostic test.

Consultation is a process of diagnosis and management which is influenced by the clinical acumen of the clinician. Studies determined to be higher in quality were performed under study conditions and may not be practical to implement into clinical practice.[40,43,48]

In terms of diagnostic accuracy, real-time teleophthalmology was considered superior to face-to-face consultation in one study and comparable in six studies. Teleconsultation is successful in detecting gross changes; however, it is limited by the quality of the live-streaming video feed. Store-and-forward image transmission coupled with real-time videoconferencing is a suitable alternative to overcome poor internet transmission speeds.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Guarantor and statement of contributorship

AT is the guarantor. AT, JM, LD and IT contributed to the development of selection criteria. LD and IT developed the search strategy, independently reviewed results, extracted data, assessed quality and drafted the manuscript. SB was a third reviewer in quality assessment. All authors read and provided feedback and approval for the final manuscript.

Supplementary materials

Supplementary materials may be accessed online alongside full text articles, or obtained through correspondence with the authors.

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