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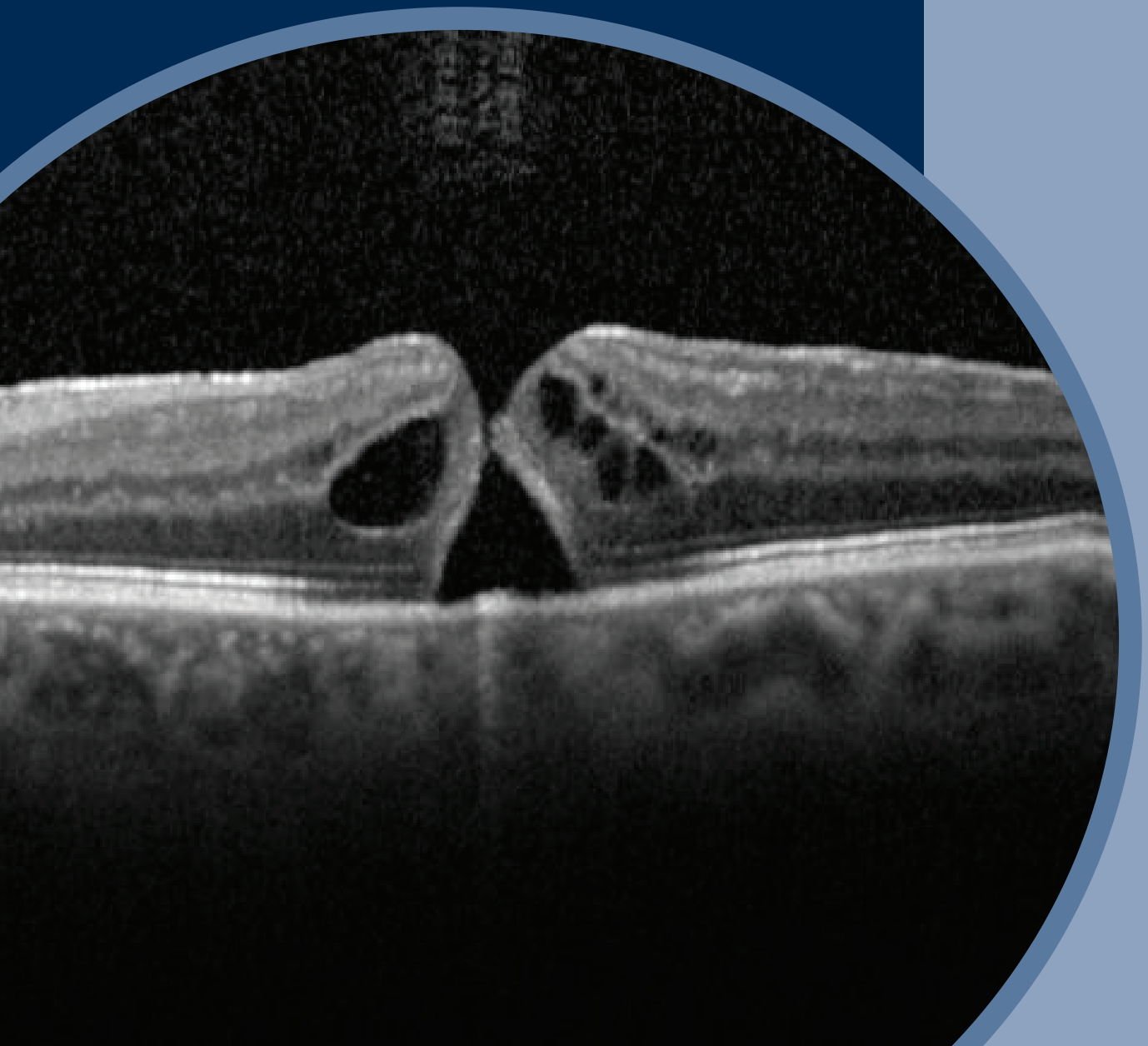
Evaluation of education of patients with AMD of treatment and services

Gaze behaviour of novice and glaucoma specialists of optic disc examination

Orthoptics Australia workforce survey 2017



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Book Chapter: Murphee AL, Christensen LE. Retinoblastoma and malignant tumors. In: Wright KW, Spiegel PH, editors. Pediatric Ophthalmology and Strabismus. 2nd Ed. New York: Springer; 2003. p. 584-589.

Web Page: Cancer Council Australia. Position statement: eye protection; 2006 [Updated Aug 2008, cited 2010 31st Jul] Available from: http://www.cancer.org.au//policy/positionstatements/sunsmart/eyeprotection.htm.

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2019 Volume 51

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CONTENTS

Educating Patients with Neovascular AMD about its Treatment and Low Vision Support Services Available to Them: An Evaluation from the Patient and Clinician Perspective

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ABSTRACT

Anti-vascular endothelial growth factor (VEGF) treatment for neovascular age-related macular degeneration (AMD) is chronic and invasive. Patient education can play a key role in reducing treatment burden. The experiences of patients undergoing anti-VEGF injections for AMD with respect to patient education have not been widely investigated, with just a few small, single-centre investigations having been undertaken. Furthermore, no study has explored issues affecting patient referral to low vision services and patient support groups in this clinical population, from the perspective of ophthalmologists and orthoptists. This study aimed to: i) investigate the experiences of AMD patients undergoing anti-VEGF treatment in relation to patient education, and ii) identify issues surrounding patient referral to support services according to ophthalmologists and orthoptists.

Forty patients (16 males, 24 females) with neovascular AMD undergoing anti-VEGF treatment were recruited from a private ophthalmology practice and public hospital in Melbourne, Australia. Patients participated in semi-structured interviews regarding the information and patient education they received about their eye condition and its management. Interviews were audio recorded and thematic analysis performed. In addition, eighteen orthoptists and one ophthalmologist, recruited from the same locations, completed a self-administered questionnaire exploring the provision of patient education and referral of patients to support groups and low vision services.

Patient satisfaction with the quantity of educational information received was low, especially in public patients. Many patients reported receiving inadequate information about AMD and its treatment. Patient awareness and uptake of low vision services and support groups was poor. Factors influencing uptake (as per patients) included: timing of referral, financial outlay, perceived benefits and accessibility. Barriers to patient referral (as per orthoptists) included: practical and knowledge-based factors, patient factors and clinical protocols.

Many patients felt uninformed about their treatment and also reported limited knowledge of available support services. Improving the provision of patient education and more consistent referral to support services may lessen treatment-related anxiety and assist patients to better manage the challenges of AMD treatment.

Keywords: age-related macular degeneration, anti-VEGF treatment, patient education, patient support groups, low vision services

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INTRODUCTION

Age-related macular degeneration (AMD) is the leading cause of legal blindness in Australia, responsible for 50% of all cases of blindness.[1] Globally, it is the third most common cause of vision impairment, affecting 30 to 50 million individuals worldwide.[2] The global prevalence of AMD is projected to increase to 288 million by 2040, owing to an increase in the average life expectancy of the population.[3] In turn, this will contribute to heightened service capacity pressures and economic burden in the future.

Of its two principal forms, neovascular AMD is less common than dry AMD, affecting only 10% of patients with AMD.[4] However, neovascular AMD accounts for most vision impairment, being attributable to 90% of all legal blindness associated with AMD worldwide.[5] Currently the most effective therapy for neovascular AMD involves repeated intravitreal anti-vascular endothelial growth factor (VEGF) injections with the aim of delaying disease progression and preserving eyesight.[6-9] Injections are typically continued indefinitely and regular ophthalmic review, often 4 to 8 weekly, is required.[10,11] Whilst treatment adherence is generally high in patients with neovascular AMD,[12,13] the ongoing and repetitive nature of the therapy protocol poses considerable burden on patients and their families.[14,15]

Central to the patient experience of ophthalmic treatment, and indeed any other medical or surgical intervention, is patient education.[16,17] Despite the chronic and invasive nature of AMD management, patients' perceptions regarding education have not been widely investigated in individuals undergoing anti-VEGF treatment for neovascular AMD.[18,19] Of the few studies to have explored this to date, all have been small, single-centre investigations with recruitment confined to only one practice location, hereby reducing external validity. Notwithstanding, these studies reported that patients receive inadequate information pertaining to the injection procedure and its outcomes.[18,19]

In a qualitative study of 10 patients undergoing anti-VEGF therapy for neovascular AMD, 90% of patients interviewed reported receiving insufficient information pre-treatment regarding: i) the procedure itself (eg use of a lid speculum, recumbent position), ii) the effect of the drug used (eg vision improvement, the need for recurrent injections), and iii) the natural history of the disease.[18] In addition, many patients reported having to actively seek information themselves from other sources such as the internet.[18] In a different qualitative study of 22 patients newly diagnosed with AMD, the majority of patients interviewed reported that they were informed that the treatment involved injections into the eye, but received little further information or opportunity to discuss the procedure in detail.[19] Inadequate information regarding clinical assessments and visual prognoses were also highlighted as key issues by patients. This lack of information was thought to not only have a detrimental impact on patients' experiences of treatment, but was also linked to heightened pre-treatment anxiety in patients.[19]

Pre-procedural anxiety has been reported in many patients undergoing intravitreal injections.[15,18,19] This anxiety is often centred on a fear of 'the unknown'.[15,19] Studies involving patients undergoing cataract surgery have found that patient education can decrease procedure-related anxiety, increase patient satisfaction with treatment and improve patients' understanding of expected treatment outcomes.[16,17] The provision of structured preoperative information may also help minimise anxiety and improve patient satisfaction with treatment in patients undergoing intravitreal injections. It is, however, first necessary to gain a better understanding of the perceptions of patients undergoing treatment for neovascular AMD in relation to the provision of educational information. The primary aim of this study was to investigate the experiences of those undergoing intravitreal anti-VEGF injections for neovascular AMD in relation to patient education.

Patient education not only relates to treatment knowledge but, in this study, also encompasses patient awareness of support services available to assist them in better managing their eye condition and its treatment, such as low vision rehabilitation organisations and AMD support groups. Despite the known benefits of low vision services such as improved independence and quality of life, in Australia fewer than one in five patients with low vision access such services.[20] Service uptake varies across the world from 3 to 15%.[21] One of the main contributors to low level service uptake is a lack of patient education leading to poor patient awareness of these services.[22] Other factors precluding uptake of vision rehabilitation services by patients include medical comorbidities, transport difficulties, language barriers and perceived lack of benefit from low vision rehabilitation.[21,23] With respect to referral, a lack of awareness of low vision services amongst eye care professionals and the need for more equal distribution of services across urban and rural areas have been identified as significant issues.[23,24] Whilst many studies have investigated the barriers and facilitators to the uptake of low vision services by patients with vision impairment, almost all of these studies have done so from the perspective of patients.[21-23] No study to date has investigated these issues from the perspective of ophthalmologists and orthoptists involved in the eye health care of patients. Moreover, no study has explored issues surrounding the provision of information pertaining to patient support groups. A secondary aim of this research was to identify issues surrounding patient education and the referral of patients to low vision services/patient support groups from the perspective of ophthalmologists and orthoptists.

METHODS

This study conformed to the provisions of the 1995 Declaration of Helsinki (as revised in Edinburgh, 2000) and relevant ethical approval was obtained before commencement (La Trobe University FHEC 13/067 and RVEEH HREC 14/1163H). All participants provided written informed consent.

Participants

Patients

Patients were purposively recruited from a private ophthalmic practice and a public eye hospital in Melbourne, Australia. All were diagnosed with neovascular AMD by an ophthalmologist and were undergoing active anti-VEGF treatment at the time of the study or had undergone treatment within the last 12 months. Participants were excluded if they were non-English speaking, or if they had a history of neurological disorder or other diagnosis that could affect memory recall, as determined by their medical record.

Ophthalmologists and orthoptists

Ophthalmologists and orthoptists working at the above clinics were invited to participate in this study. It was a prerequisite that participating ophthalmologists and orthoptists had a minimum of two years' experience working in vitreoretinal clinics and in managing patients with neovascular AMD.

Procedure

In-depth interviews

Patients took part in semi-structured, one-on-one interviews exploring their experiences in relation to anti-VEGF treatment. An interview topic guide was used, the development of which was based on data obtained from two patient focus groups conducted prior to the one-on-one interviews. The purpose of the focus groups was solely to inform the development of the interview schedule. The focus groups lasted for approximately one hour and were conducted with a total of five participants (2 males, 3 females) who met the same patient eligibility criteria. Topics that arose from the focus group data included: i) burden of therapy, ii) strategies used to manage burden of therapy, iii) satisfaction with treatment and service delivery, iv) treatment motivation, v) effect of patient education, and vi) the provision of information relating to patient support groups/low vision services and patient awareness of such services. The framework for the in-depth interviews covered all of the aforementioned topics, however, only the findings in relation to topics v and vi above are discussed in this paper. The findings with respect to the latter topics were extracted as a subset of the original data and are exclusive to this paper, with all other findings having been reported elsewhere.[15]

During the interviews, the specific wording and order of questions was flexible and adapted to each participant as needed. Given the semi-structured format, deviations from the main points of discussion were permitted and the researcher was able to explore these leads where appropriate or probe to elicit further responses.

All interviews were audio recorded and transcribed strict verbatim, with the exception of two where participant consent to be recorded was not provided, for which detailed written notes were made. The semi-structured interviews lasted between 1 and 2.5 hours and were undertaken at either the participant's home or a private meeting room at the treating clinic/hospital. All interviews were conducted by the first author (JB). The researcher was not directly involved in the care of participants at either treatment location.

The focus of this paper is on patient education and the provision of information relating to support services. As such, only those interview findings pertaining to this specific theme will be discussed herein. These findings are exclusive to this paper. Details of the other findings that emerged from the patient interviews have been reported elsewhere.[15]

Electronic questionnaire

Eye health care professionals participating in the study were invited to undertake an electronic questionnaire designed by the study investigators using Google Forms. Questions were informed by the results of the patient interviews and related to issues surrounding patient education and the provision of information to patients about AMD support groups and low vision services, as well as barriers and facilitators to referring patients to these services. The questionnaire consisted of 36 compulsory closed-ended questions and 17 optional open-ended questions. To ensure participants remained anonymous, no information regarding participant demographics was collected during the survey with the exception of which health sector/s (public and/or private) participants worked in. The questionnaire was self-administered and took approximately 15 minutes to complete.

Data analyses

Interview transcripts were coded by one researcher (JB) using NVivo 10 (QSR International, Doncaster, Australia). The data were coded by organising and categorising information into emergent themes using an iterative strategy and comparative method until all meaningful data had been coded. To enhance analytical rigour and auditability, a decision trail was used to document decisions made and rules developed for the assignment of the data into themes.[25] Thematic analysis of the coded data was undertaken. For each theme that emerged, the coded narratives of private patients were compared to those of public patients, and the similarities and differences identified. A content analysis approach was also used in that participant responses were numerically counted.

The Mann-Whitney U test was used to analyse differences

in patient age, gender and distance travelled to receive treatment between public and private patients. The assumption of normality was violated for all variables with the exception of age, and therefore non-parametric statistical tests were used. The level of significance was set at $\alpha = 0.05$. Descriptive statistics were used to summarise the data arising from the electronic survey.

RESULTS

Participant demographics

Forty patients (16 males, 24 females) participated in this study, not including the five focus group participants. The sample included all eligible participants who were approached with the exception of two patients who declined participation owing to reasons of chronic illness. Nineteen patients were recruited from a private ophthalmic practice and 21 from a public eye hospital. The mean age of patients was 81.95 years (range = 64 - 93). There was no significant difference in the mean age ($p = 0.206$) nor gender ($p = 0.799$) of private and public patients. Public patients travelled significantly further to the treating clinic (mean 38.9 km, range = 8.3 - 113.0) than private patients (mean 10.4 km, range = 1.8 - 34.8) ($p < 0.001$). No patients withdrew from the study.

Eighteen orthoptists participated in this study. Thirteen worked in the private sector, four in the public sector, and one worked in both the private and public sectors but primarily public. Whilst 20 ophthalmologists were invited to participate in the electronic survey, only one response was received and as such this data was not included in the analyses. Multiple follow-up invitations were issued however the response rate of ophthalmologists remained poor.

In-depth interviews

Several global themes emerged from the patients' narratives, one of which was patient education. The findings pertaining to this specific theme are exclusively provided in this paper. Details of the other findings have been reported elsewhere.[15] The theme of patient education encompassed: i) patient satisfaction regarding information provided to them about their eye condition and its treatment; ii) the use of optical coherence tomography (OCT) as a patient education tool and the value that patients placed on receiving this type of feedback as part of their treatment; and iii) patient awareness of AMD support groups and low vision services available, as well as factors influencing service uptake.

The patient experience with respect to patient education was found to differ according to whether individuals were treated in the public or private setting. Table 1 shows examples of participants' narratives from both public and private patients pertaining to this global theme, as well as the number of references made in relation to each of its organisational sub-themes.

Effect of clinical setting on provision of information

Patients' experiences in relation to the level of information provided to them differed between individuals and varied depending upon whether they were treated in the public or private setting. Patient satisfaction with the quantity of educational information provided was high in private patients but low in public patients. Public patients often reported feeling ill-informed about AMD and the purpose of treatment. In one instance, one public patient who had received multiple injections reported that she was not aware as to why she was undergoing treatment until being recruited into the study. Several public patients reported that they undertook 'information prompting', whereby they probed specialists for information and asked questions pertaining to their eye condition and treatment. These patients expressed that they felt the need to do so, otherwise limited information would be provided to them.

Effect of visual aids (OCT scans) on patient understanding of disease and treatment

Patients are sometimes shown their OCT scan during treatment visits as a means of feedback on their eye condition and how their treatment is progressing. This was perceived by most patients to be a useful adjunct to the verbal explanation provided by their specialist as it facilitated their understanding of their eye condition and their response to anti-VEGF treatment. Differences were however reported amongst patients as to how often they were shown their OCT scan. Most private patients reported being shown their OCT scan by their specialist on a regular basis when presenting for treatment. In comparison, few public patients reported having been shown their OCT scan in the past despite being interested in this. Consequently, this contributed to these patients feeling relatively uninformed about treatment.

Some patients also expressed that being shown their OCT scan created an opportunity for them to communicate with their specialist and ask questions. It allowed them to feel included in the treatment decision-making process. Whilst the decision whether and how often to treat is largely at the discretion of the ophthalmologist, patients valued being informed about the underlying reasons governing the need for and frequency of treatment. Many public patients who were not shown their OCT scan expressed that they felt largely excluded from the treatment decision-making process.

Table 1. Illustrative examples of participant narratives from public and private patients relating to each sub-theme under the global theme 'Patient education'.
The number of public and private patients who made at least one comment and number of comments made are also shown for each sub-theme

GLOBAL THEME: PATIENT EDUCATION					
		Organisational theme: General provision of information			
		Public patient responses		**Private patient responses**	
	Satisfaction with quantity of educational information provided	7 participants 26 responses	*"No, no, no I haven't had… No clue whatsoever of what goes on, I don't… No"* (ALB003, male, age 87) *"I got no explanation. There was no information provided... Just told "You're getting an injection", well I sort of thought, "What the hell for?" I didn't know it was for macular... I didn't know until you told me."* (AND005, female, age 79) *"[I'd like] to know a little bit more. You're sort of kept in the dark a bit."* (BOY006, female, age 79)	6 participants 14 responses	*"I definitely had all the information provided... It has been plenty, for what I want."* (BOW017, female, age 89) *"It's been about right. I feel pretty informed across all the aspects of the disease as far as I need to know."* (FLO004, male, age 64)
	Information prompting	6 participants 9 responses	*"I had a verbal explanation as well, because I am a person who always asks things. Yes, I always ask. I ask if this is good for me or not. Yes, I do ask. Even one of the doctors told me to - there is no other treatment, there is no laser, nothing else, but eat erm, yellow veggies… Things like that, that probably another person doesn't know because they don't ask. But this is not every time, because if I don't ask they don't tell me anything."* (BEN015, female, age 76) *"If I ask a question, then I get answers."* (BIR021, female, age 87)	N/A	
		Organisational theme: Effect of visual aids (OCT feedback) on patient understanding of disease and treatment			
		Public patient responses		**Private patient responses**	
	OCT feedback is a useful adjunct to verbal information	14 participants 29 responses	*"I would like to see what's going on. Like here, this eye had a bleed and they said 'Oh you know, there was a scar there from the bleeding.' I would like to see that scar."* (BOY006, female, age 79)	12 participants 26 responses	*"I do love to see the visual image, exactly what's happening. And then I can see the improvements. I can see the peaks like this, you know. They're coming down all the time. It's very good to see that."* (FYF005, female, age 87)
	Desire to be shown OCT scan	17 participants 29 responses	*"They're (specialists) looking at it and I'm looking over their shoulder and thinking, what the hell's going on here?"* (AND005, female, age 79) *"Like the other day... The doctor... He said eight weeks before I went back in and then he said, 'No, six weeks'. I would like to have known why. I should've asked him but I didn't."* (AND005, female, age 79)	15 participants 32 responses	*"When he explains it to me, I understand what is going on and why I am having the treatment. I see the images on the screen… You know that's the reason why you need it."* (DAW012, male, age 87) *"… Tis a month and in the month it's got back to what it was last time usually. So I see, I see a 'sameness' but she (doctor) sees a difference. And then she'll show me the two pictures side by side and then you can see the difference. Erm, so that's what I mean, I'm, I'm in the loop, I'm, I'm being informed all the time of what's going on, which is great."* (SHA007, female, age 78)
	Usefulness of OCT feedback dependent upon specialist's interpretation and other factors	9 participants 12 responses	*"I couldn't understand it at all. Too technical."* (GAV011, female, age 87) *"I, I think for me anyway, just a pencil drawing... Um, you know, because you look at the scan and it's got lines everywhere and little dots and things... But just even a pencil drawing of, saying this is your eye, this is the back of it and this is what's happening, you know? Maybe even that simple..."* MAS008, male, age 89 *"When they show it to you, you've got drops in your eyes and it's all blurry and it's, it's really… I can't see it that well."* (MAL010, female, age 79)	12 participants 13 responses	*"Well it's hard to understand for somebody who is not in that field. I can remember him showing me on the computer and I thought well it doesn't really mean much to me. I have to rely on what he says."* (DEL009, female, age 88) *"Even though I may not truly understand it, in my mind it helps to clarify what he's talking about if he can say 'Well there are signs of so and so there' and point it out. He might use a clinical term... And there's a little bump at the bottom and I understand that's what he's talking about."* (LOW016, male, age 93)

Patients acknowledged that the degree of benefit from being shown their OCT scan was largely dependent on their specialist's explanation of the scan. Consequently, some patients indicated that more simplified information, such as a schematic drawing, might be of greater use to them. Other factors influencing the usefulness of OCT feedback included the patient's level of vision impairment and whether they had had topical mydriatic agents instilled.

Patient support groups and low vision services

Almost all patients were unaware of available AMD patient support groups, such as Bayer's Smart Sight Program or Novartis' Via Opta, with only one patient interviewed during the study being aware of, and currently enrolled in, such a group. This patient was a private female patient. Patient awareness of general low vision services provided by support organisations, such as Vision Australia and Guide Dogs Australia, was greater than awareness of patient support groups. This was observed in both public and private patients.

Several patients reported that they were aware of low vision services available to them, however only a few of these had utilised such services. These patients were typically private patients and female. In most instances, patient knowledge of low vision services was first acquired through a relative or visiting district nurse. Few patients were referred by their treating ophthalmologist or orthoptist. Of those who had utilised a low vision service, satisfaction varied in relation to the quality of service received.

Several key factors were identified by patients when considering whether or not they would utilise a patient support group or low vision service. The timing of referral to a patient support group or low vision service was thought to be an important consideration. Most patients expressed that a support group would be most beneficial if offered at the time of diagnosis, owing to being unfamiliar with the treatment procedure and treatment-related apprehension typically being higher. With respect to low vision services, any financial outlay associated with the uptake of the service or product was an important consideration. Patients indicated that they were prepared to make sacrifices to afford a low vision product or service if it was perceived to be of benefit, however many patients did not perceive such products and services to be of personal benefit to them. The majority were of the belief that a patient needed to be significantly vision impaired in order to benefit from the service and as such, did not consider their own vision to be sufficiently reduced to warrant service uptake. This was often despite the patient describing difficulty in managing their day-to-day affairs, including undertaking household chores, and reading and managing bills. The location and accessibility of the patient support group or low vision service was of importance. Many expressed that transport to clinic-based low vision organisations can be difficult owing to being: unable to drive, reluctant to use public transport, and/or reliant on relatives or carers to provide transport and acquire leave from work. Many reasons were identified by patients both in support of and against the uptake of patient support groups and low vision services. These reasons have been outlined in Tables 2 and 3 with supporting patient narratives.

Table 2. Reasons for the uptake of patient support groups or low vision services as provided by patients

Reason	Example of supporting statement
Patient support group presents an opportunity to make new friends and support one another	*"We can find friends there… having the same problem"* (BEN015, female, age 76, public patient)
Help to relieve feelings of loneliness, anxiety and frustration	"I would like to know what other people think as well as myself. I feel lonely, thinking about it. And if I had someone to talk to, it would help" (AND005, female, age 79, public patient)
Opportunity to receive additional information and means of keeping informed	*"You know, I've kept involved. I've seen paperwork from the Macular Degeneration people and joined them, you know. I don't know, I think I joined their membership or something. In fact I think they sent me an information sheet the other day. Dispensing useful information, you know. Well, interesting information anyway"* (SMI008, male, age 92, private patient)
Might not need all products/services on offer but at least it provides options	*"I mean, when you go into that room, all of the things that you can have. I felt so much better when I came out of there because, you know, there were things you don't even think about, you know, like filling your cup up with - you know, to make a cup of tea. Well, you're probably pouring water all over the place. But, I mean, there's something there to tell you that's how far you go up the cup. How good is that!? And um - oh, absolutely blew me away, that place"* (SWA013, female, age 93, private patient) *"I said to her, there's a lot of this I don't really need right now, and I didn't then. Um but there might come a time and I want to know what's available to me"* (SWA013, female, age 93, private patient)
Positive attitude towards seeking help	*"That's my attitude, that if there's anything that can help you... Vision Australia, anywhere, I will try it. And that's what all these things are for… To help you. So you do have to take it - I mean, you're very foolish if you don't take advantage of all these things that are there to help you"* (SWA013, female, age 93, private patient)
Notion of: "I like to be ahead of the disease". Prefer to learn to use a product or service now whilst still a sighted-patient.	*"I did ring them because I wanted to go down. I like to be sort of ahead if I can… I wanted to go down and see what was available. Um and ah - and it was quite interesting really… I mean, it's amazing the things they have there"* (SWA013, female, age 93, private patient)
Patient support group would be useful to discuss the impact of AMD and coping with low vision, more so than the treatment itself	*"Um... Not, not as far as the injections go… Um, but as far as general vision is concerned, I would like that"* (SEL006, female, age 81, private patient)

Table 3. Reasons against the uptake of patient support groups or low vision services as provided by patients

Reason	Example of supporting statement
Existing patient knowledge of AMD and its treatment is adequate and therefore it is felt that uptake of service is not warranted	*"I really haven't felt the need. No, I think it was all - everything was all explained well enough and I knew enough about it then that it, no didn't need it"* (FYF005, female, age 87, private patient)
Perception that product/service won't be of benefit to the individual patient, but may help others (eg non-English speaking patients, anxious patients)	*"Probably not. Only because uh, you know I'm aware of what has to be done, and the - and the consequences if you don't have it done. Whereas I just imagine somebody like an ethnic person who had not - no idea whatsoever, and got all stressed out about it all would need something like that"* (BRO017, female, age 76, public patient) *"I don't think it's going to make any difference to my eye, whether I talk to anybody or not. It's there and you know… Yeah, the only thing it would be - it could be a calming nature if people are agitated about it I guess. That - that - that's the benefit to that I guess"* (BRO017, female, age 76, public patient) "Mm [pause], I suppose some people would like to do that. It's never occurred to me that I would like to do that. Um, [pause] um, no it hasn't. It - it hasn't occurred to me… But I guess some people would like to do that. I think I go all right…" (SMA014, female, age 74, public patient)
Perception that appropriateness/usefulness of the service is age-dependent; more appropriate for a patient who is younger and more active in community	*"No, I don't think so. Don't think so, not at my age… and, you know, sort of thing. Because, see, see, it does happen to people much younger too and they're more active, you know, sort of thing… Although it has - that is one effect that it's had on me, I'm far - I'm not as active as I was… because, I mean, I'm, I'm old but, you know… I didn't, I didn't, um, didn't feel old until I got this. And now, I, I feel old because I'm very, ah… And I'm frightened of missing a step or, you know, that type of thing"* (GAV011, female, age 87, public patient)
Perception that patient's current level of vision does not warrant uptake of patient support group or service	"No. No, not as yet because I don't think I'm, I don't think it's necessary yet" (MAL010, female, age 79, public patient)
Reluctant to seek help from others	*"Well, I hadn't been told anything about that, I wouldn't even be interested. I've battled and struggled and we've managed all our lives, Betty and me. Fought our own battles..."* (ALB003, male, age 87, public patient)
Feel well supported and adequately cared for by existing family and friendship networks	*"We had a nurse come in here the other day. And something came up about the fact that I had macular degeneration. Oh, she said you've got - you can get support. But I really don't, I don't really need it. I get support from family and friends who want to know how it's going. That's alright, so - you know so it's not too bad"* (BAN002, male, age 86, private patient) *"… I was lucky, my daughter in law, she's a nurse and close and she's just marvellous, you know. She got on the phone to Dr X. She was as concerned as me, you know. And she came and sat and watched the first. But no, I've had her all along so I really don't think a support group would help"* (MUR010, female, age 90, private patient) *"I've got a cousin who's got dry actually, and she's worse than I am. But we sort of get together and… So we sort of support each other and…"* (TEL003, female, age 80, private patient)
Opportunities to talk to others who are diagnosed with AMD already exist (relatives, friends, other patients in waiting room)	*"I don't think that's necessary for me. I want to stay in the norm. You know, I… Yeah. I just want to stay in the norm. I, I've become friends with quite a few people in there and we can tell stories. We tell stories about stupid things we do. Ah, so I, you can, you do form a rapport anyway… So I don't want to go down that road"* (MAL010, female, age 79, public patient)
A preference for one-on-one discussion between friends over group discussion with strangers	*"I don't know. A couple of people have rung me. Friends who know that I've got it. To say that they've just been diagnosed and what's it like. What the injection's like they've really wanted to know [laughs]. And I tell them – fine. I think what's happened with people that I know, who have rung me. Well, they've been friend to friend. I think if you just had someone you could ring up. Who could just tell you it doesn't hurt"* (SEA015, female, age 73, private patient)
Can't be bothered or not interested	*"But I always feel um [pause]… You know, I [pause]… didn't want to call on them, ah. I am aware that there is even a society for people like that. But I don't think I can be bothered with that"* (BOW017, female, age 89, private patient)
Lack of time owing to other medical appointments and social commitments	*"Well, it wouldn't benefit me, I don't think because I really haven't got time. By the time you do your medical things, and you know, you go and have a couple of lunches with, you know… Or see the family um the week's gone. Then I get so tired, you know…"* (SWA013, female, age 93, private patient)
Acceptance of condition or treatment situation for what it is. Don't wish to discuss it with others.	*"I don't think so. I don't think I'd go. Well, see with my fibromyalgia as well, they have group thing-os and that. I don't go to those. Because I think well I've got it, they've got it. What are we going to do - sit there and compare notes about how much pain we're in? No."* (JAN012, female, age 79, public patient) *"I accept what it is. I don't dwell on it too much"* (TER001, male, age 79, public patient) *"No. No, no, I just prefer not to… I'm the same with my, erm, breast cancer. I don't go to groups. I suppose it could help others maybe, but I just want to put it behind me. And this is just part of my life now, you know. I don't have to share it with anybody..."* (SHA007, female, age 78, private patient)
Perception that you must be a certain type to join groups	*"I have not had anything to do with support groups. I don't think I am that sort of type really, you know"* (FLO004, male, age 64, private patient)
Negative stigma associated with uptake of service or use of product; desire to "stay in the norm" and perception that use of service constitutes falling out of the norm	*"I don't think that's necessary for me. I want to stay in the norm. You know, I…Yeah. I just want to stay in the norm. I, I've become friends with quite a few people in there and we can tell stories. We tell stories about stupid things we do. Ah, so I, you can, you do form a rapport anyway… So I don't want to go down that road"* (MAL010, female, age 79, public patient)
Travel/accessibility	*"I don't know. I don't know, I think it's bad enough … [long pause]… I suppose, I don't know … [long pause]… Not sure that I'd want to go. All be miserable together [hysterical laughter]. And you have to get there and ah, you see I wouldn't drive a long way. I wouldn't go far. Because I would only drive around here"* (BOW017, female, age 89, private patient) *"I wouldn't be interested now. Maybe early on but then I've always had a problem with the transport because I don't drive and I've had the problems with the taxi before I started. And the family, I guess they used to drive me around and my husband did prior to that. You know before he passed away, he drove. So, it wouldn't be any good to me now but I s'pose as long as you had transport and you were able to get out… I could"* (SIN011, female, age 88, private patient)

Questionnaires

Referral of patients to patient support groups

Figure 1 shows the frequency with which orthoptists surveyed refer patients with neovascular AMD to patient support groups. Of those orthoptists surveyed, 67% (n = 12) indicated that they never refer patients to patient support groups, and a further 17% (n = 3) indicated that they seldom refer patients. Ophthalmologists, followed by orthoptists and then nursing staff, were most frequently identified by survey respondents as the health care professionals within their workplace who were primarily responsible for the referral of patients to patient support groups and low vision services.

Of those orthoptists who indicated that they refer patients to support groups (n = 6), 67% felt that less than half of those patients that they refer actually enrol in the support group. The remaining 33% indicated that they felt half of those patients whom they refer actually enrol in the patient support group. Of those orthoptists who had previously provided patients with information pertaining to patient support groups, this information was most commonly provided to patients via both written and verbal means.

Barriers and facilitators to the referral of patients to patient support groups

Table 4 lists the barriers, as reported by orthoptists, to referring patients to patient support groups and Table 5 shows suggestions provided by orthoptists as to how these barriers might be improved or resolved. Some of the most commonly reported barriers included time constraints in clinic which prohibited orthoptists from providing patients with information, and lack of clinician awareness around patient support groups. To address these barriers, a streamlined and more efficient electronic referral process was recommended, as well as the provision of greater workplace training.

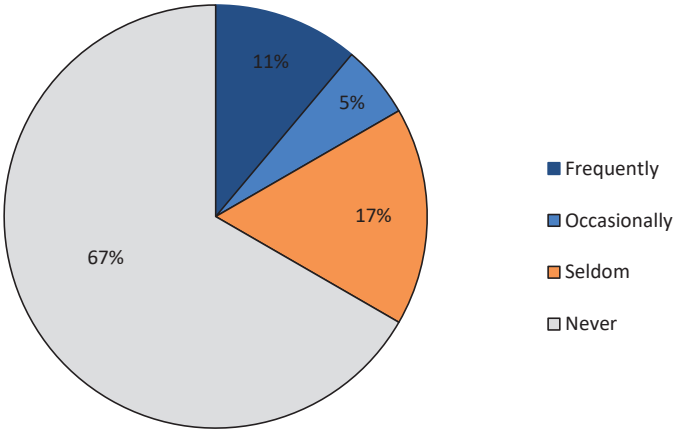

Figure 1.
Frequency of referral of patients with nvAMD to patient support groups by orthoptists.

Table 4. Barriers to the referral of patients to patient support groups

Type of barrier	Examples	Number of survey respondents who identified this as a perceived barrier
Practical	Time constraints in clinic	3
	Lack of ease of referral	1
Knowledge based	Lack of clinician awareness that patient support groups exist	4
	Limited knowledge regarding the types of services and/or benefits offered to patients upon enrolling in a patient support group	1
	Limited information available in relation to patient support groups that can be relayed to patients	2
	Having the knowledge to be able to identify patients in need of these support services	1
Patient factors	Location of service not convenient for patient	1
	Perception that patient support group will not benefit the patient for a variety of reasons (eg patient has trialled it before)	1
	Clinician met by the reluctance of patients to uptake the support group as the patient can't be bothered or they feel that they do not require help	2
Clinical protocol	Practice protocol	1
	Not considered routine clinical practice to recommend such support groups to patients	1
	Perception that it is the responsibility of the ophthalmologist to refer patients to support groups if necessary	2
Other	Commercial bias of support groups	1
	Support services are often internet-based and therefore deemed accessible to the patient without the need for clinician referral	1

Table 5. Recommendations for how barriers to the referral of patients to patient support groups might be improved or resolved	
Type of barrier	**Recommendation/s**
Practical	Referral process to be made easier by the use of referral pads or an internet referral system whereby referrals can be made quickly and sent in the presence of the patient
Knowledge based	Offer greater tertiary based training and workplace training in these services
	Increase awareness and educate eye health care professionals about the types of services that exist for patients
	Educate eye health care professionals on the types of clues or criteria that identify patients who are eligible for/might benefit from referral to such services
	Make information more readily accessible – most patients are elderly and don't have or use internet
	Employ a consultant who has increased knowledge of patient support groups to contact patients
Patient factors	Increase home visits to rural and remote areas
Clinical protocol	Ophthalmologist to make the referral of patients to patient support groups by orthoptists part of their clinical protocol
	Change to current clinical protocol whereby orthoptists enlisted with responsibility of referring patients and a system is introduced whereby patients are referred before/after their initial injection as standard procedure

Referral of patients to low vision services

Figure 2 shows the frequency with which those orthoptists surveyed refer patients with neovascular AMD to low vision services. Only 11% (n = 2) of orthoptists surveyed indicated that they frequently refer patients to such services. Thirty-three percent (n = 6) of orthoptists surveyed indicated that they never refer patients to low vision services. This was not dependent on where the respondents worked. However, by their own report, the referral of patients to low vision services by orthoptists was higher than the referral of patients to patient support groups.

Of those orthoptists who indicated that they refer patients to low vision services (n = 12), 58% thought that only half of those patients that they refer actually utilised the service, 33% thought that most of those patients that they refer utilised the service, and 9% thought that all of those patients that they refer utilised the service. Of those orthoptists who had previously provided patients with information pertaining to low vision services, this was most commonly done via verbal discussion only.

Barriers and facilitators to the referral of patients to low vision services

Table 6 lists the barriers, as reported by orthoptists, to referring patients to low vision services and Table 7 shows suggestions provided by orthoptists as to how these barriers might be improved or resolved. The most common barriers to referral were clinic time constraints and clinicians' lack of knowledge about low vision services available to patients. A change in clinician workload, the addition of more clinical staff, an easier referral process, and low vision up-skill workshops were offered as recommendations to lessen these barriers.

Orthoptists were also asked to indicate their level of agreement/disagreement with respect to whether certain factors influenced whether or not they refer patients with neovascular AMD to patient support groups and low vision services. Figure 3 shows the percentage of orthoptists and corresponding level of agreement for each factor. Sixty-one percent of orthoptists surveyed (n = 11) indicated that the location where a patient lives did not influence whether or not they referred patients to patient support groups and low vision services. However, 80% of orthoptists surveyed (n = 15) reported that the perceived ability of a patient to comprehend information provided to them influenced whether or not they referred patients.

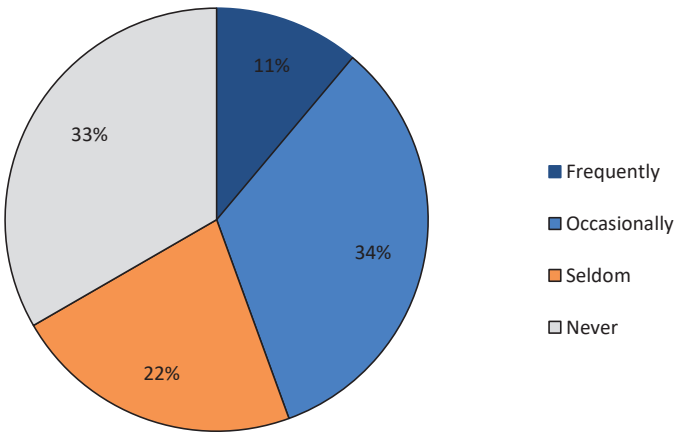

Figure 2.
Frequency of referral of patients with nvAMD to low vision services by orthoptists.

Table 6. Barriers to the referral of patients to low vision services

Type of barrier	Examples	Number of survey respondents who identified this as a perceived barrier
Practical	Time constraints in clinic	5
	Possibility of interruption to clinic flow	1
	Some referral pads supplied are designed for ophthalmologist or optometrist referral	1
	Lack of referral pads or brochures in clinic	1
Knowledge based	Lack of knowledge about low vision organisations available to patients	2
	Lack of knowledge around the types of services that different low vision organisations offer to patients	1
	Lack of guidelines around how to identify patients who could benefit from such services	1
Patient factors	Accessibility/location issues	2
	Consideration for burden placed on relatives or carers to provide transport or accompaniment	1
	Patient has already trialled service and it did not benefit them	1
	Patient managing okay without the need for low vision aid	1
	Perception that more appointments would not be welcomed by patient	1
Clinical protocol	Not current practice protocol	1
	Perception that it is the responsibility of the ophthalmologist to refer patients to low vision services if necessary	1
Other	Patient must first indicate to clinician that they are experiencing difficulty in undertaking activities of daily living before referral is initiated	1
	Perception that it is the preference of the patient to speak with their ophthalmologist about such services, over other eye care providers	1

Table 7. Recommendations for how barriers to the referral of patients to low vision services might be improved or resolved

Type of barrier	Recommendation/s
Practical	Change in workload/more staff
	Easier referral process
Knowledge based	Establish guidelines that clinicians can use to identify patients who could benefit from service
	Educate clinicians as to low vision services available (eg low vision up-skill for orthoptists and ophthalmologists)
	Clinicians to undertake self-directed research into the organisations and services available to patients in order to be able to better inform patients
Patient factors	At-home low vision assessment
Clinical protocol	Greater liaison with ophthalmologists – if doctor allows orthoptist to suggest referrals then this needs to be communicated. If the doctor would like the decision of referral to rest with them, but would like the orthoptist to talk to the patient/provide information then there needs to be a method of communicating this in the patient notes.

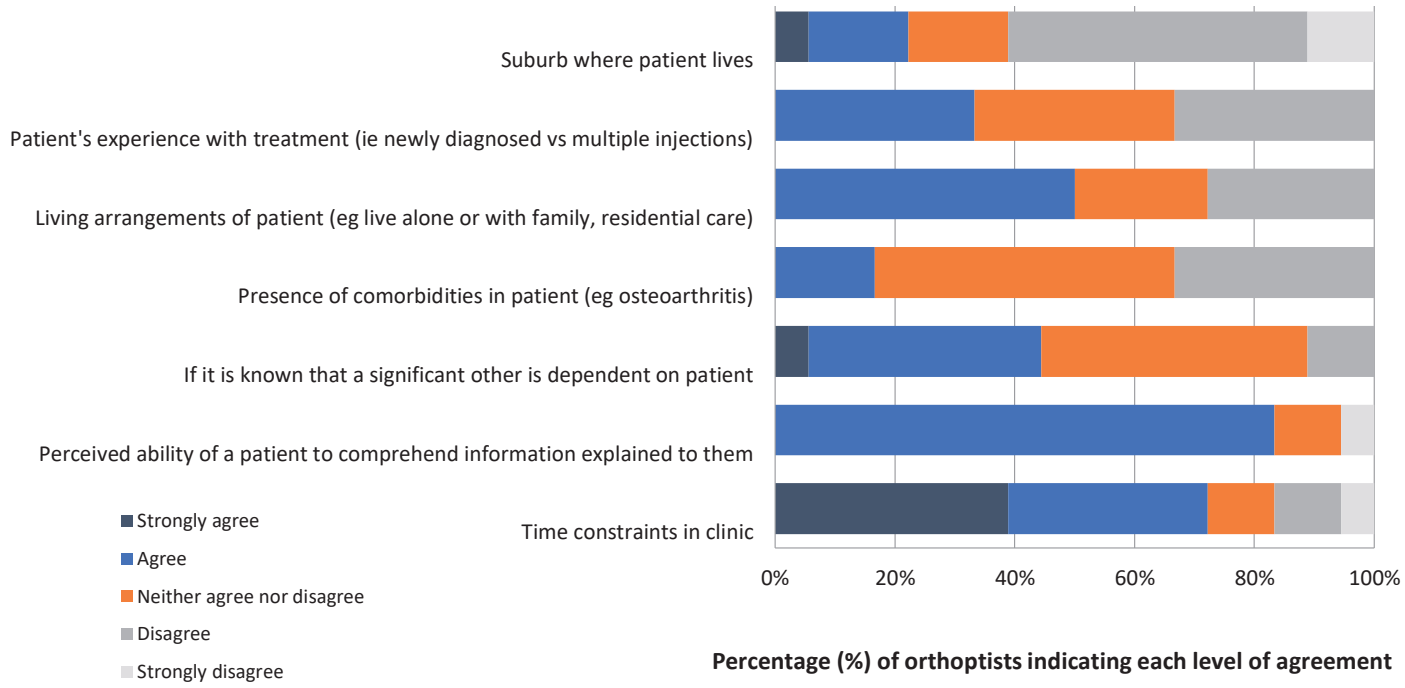

Figure 3.
Level of agreement as to whether certain factors influence orthoptists when considering referring a patient to a patient support group or low vision service.

DISCUSSION

This study investigated the experiences of patients undergoing repeated intravitreal injections for neovascular AMD in relation to patient education. It also explored issues surrounding the provision of information to patients regarding low vision services and AMD support groups from the perspective of orthoptists.

To date, only a few studies have investigated the perceptions of patients undergoing treatment for neovascular AMD with respect to the provision of educational information.[18,19] These studies have reported that patients lack information relating to the treatment procedure, expected visual outcomes, ocular assessment and the natural history of AMD.[18,19] The generalisability of these findings was limited however, owing to small sample size and almost all participants being treatment-naive at enrolment. Furthermore, participants were recruited from only one practice location in each of these studies. As such, some of the issues surrounding patient education may have been specific to the clinic where participants were recruited from. Our study has added to the scarce research in this area and extended the applicability of previous findings in that it incorporated a larger number of participants who were recruited from both a public and private clinic.

Overall, this study found that patient satisfaction in relation to the provision of educational information varied. Many patients felt inadequately informed about AMD and its treatment. This finding was congruent with the results of previous studies.[18,19] A trend was observed in our study whereby satisfaction was higher in private patients than public patients. Public patients also reported that they felt the need to probe specialists for information and ask questions, or else limited information would be provided. This has not been explored in previous research owing to a lack of sub-groups.

Visual information in the form of OCT feedback was perceived by most patients to be a useful adjunct to any verbal information conveyed by their specialist and facilitated their understanding of their treatment. However, discrepancies were found to exist with respect to the frequency with which patients were shown their OCT scan. Most private patients reported being shown their OCT scan regularly. In comparison, few public patients reported having been shown their OCT scan. This was thought to contribute to public patients' feelings of relative exclusion from the treatment decision-making process. The usefulness of OCT feedback provided was dependent upon adequate explanation of the scan by the treating physician, the patient's level of vision and whether or not topical mydriatics had been instilled. Previous studies have not reported on the impact of receiving OCT feedback on patients' understanding of treatment in this clinical population.

This study also revealed a significant lack of patient

awareness regarding low vision services and support groups, irrespective of whether patients were treated in the public or private setting. A minority of patients had utilised a low vision service in the past and only one patient had previously enrolled in a patient support group. Amongst these patients, knowledge of the service was typically first gained through a family member or district nurse and not their treating eye specialist. Factors influencing the uptake of low vision rehabilitation services and patient support groups, as identified by patients included: timing of referral, financial outlay, perceived benefit/s, and accessibility. Whilst no study to date has explored the barriers preventing the uptake of patient support groups in this clinical population, these findings were consistent with previous studies investigating factors influencing the uptake of low vision rehabilitation services by patients.[21,24]

This study was the first to investigate issues surrounding the provision of information to patients regarding low vision services and support groups according to orthoptists. Referral rates were low. Of those orthoptists surveyed, 67% indicated that they never refer patients to patient support groups and 33% indicated that they never refer patients to low vision services. Barriers to the referral of patients to low vision services and patient support groups, as identified by orthoptists included: practical factors (eg clinic time constraints), knowledge-based factors (eg lack of clinician awareness), patient factors (eg perception that the service will not be of benefit to patient) and clinical protocol. Suggestions to improve these barriers included: a more simplified referral process, greater education and training for orthoptists, and a change to existing clinical protocol which would see orthoptists enlisted with greater responsibility in terms of referring patients.

A limitation of this study was that the response rate amongst ophthalmologists was poor (n = 1) and consequently, this precluded data analysis. The low response rate of ophthalmologists was thought to be owing to these individuals being time-poor and therefore less inclined to participate. Also, only a small number of orthoptists participated in this research. The researchers chose to evaluate the perceptions of eye health care professionals by way of electronic survey as it was thought that this would yield a higher response rate than a more in-depth approach, such as one-on-one interviewing, especially given that these professionals are typically time-poor.

Whilst the development of the electronic survey was informed by the patient interview data, the survey used was not psychometrically validated. At present, there is a lack of validated tools available to assess the perceptions of eye health care professionals with respect to patient education and issues affecting the referral of patients to support services. Finally, this study did not include patients who were non-English speaking. All patients needed to be English speaking in order to participate in the in-depth interviews conducted as part of this research. However, non-English speaking patients are often subject to significant barriers with respect to patient education and language barrier can prohibit the uptake of low vision services. This is an important consideration for future research.

CONCLUSION

Intravitreal anti-VEGF therapy represents the current treatment method of choice for neovascular AMD. Despite treatment adherence typically being high in this clinical population,[13] many patients report receiving inadequate information in relation to their treatment, especially those in the public setting. This contributes to them feeling uninformed and not included in the treatment decision-making process. Effective patient education has been shown to reduce procedural anxiety in patients undergoing other ophthalmic procedures, such as cataract surgery.[14,15] Pre-treatment anxiety is common in patients receiving anti-VEGF treatment[15,18,19] and strategies to improve patient education may help lessen this, especially given that the main reasons contributing to anxiety in these patients are a fear of the unknown and unfamiliarity with the treatment procedure.[15,19] Improving patient education by increasing the quality and quantity of information provided and up-skilling clinicians in their knowledge of patient services may help to increase patient awareness of ancillary services available, such as low vision rehabilitation and patient support groups. This, in turn, may assist patients to better manage their eye condition and its treatment. Despite being largely under-utilised, such services may be of benefit to patients with AMD in coping with anti-VEGF therapy and the ongoing, burdensome treatment protocol.

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Gaze Behaviour and Accuracy among Novice and Glaucoma Specialist Orthoptists During Optic Disc Examination: A Cross Sectional Study

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ABSTRACT

Aim: To examine the extent to which level of clinical experience of orthoptists influences eye movements, gaze behaviour and diagnostic accuracy when examining optic disc images for glaucoma.

Methods: Eye movements and gaze behaviour of participating orthoptists were recorded whilst examining 20 optic disc images for signs of glaucoma. A maximum of 90 seconds was given per image to perform the examination. At the conclusion of each examination, participants were asked to determine whether it was unlikely, possible, probable or certain that the optic disc image had glaucoma. The main outcome measures were examination time, number of fixations, time spent on areas of interest, gaze behaviour and glaucoma likelihood agreement between orthoptist groups.

Results: A total of 41 orthoptists (36 novices and 5 glaucoma specialist orthoptists) agreed to participate. Using multivariable linear regression, there was no difference in optic disc examination times between orthoptist groups or for the total number of fixations made. Those with more experience made significantly more fixations when assessing images with possible signs of glaucoma ($p = 0.024$). Glaucoma specialist orthoptists methodically examined the optics disc, visualising areas most likely to display glaucomatous damage. Novice orthoptists displayed random gaze behaviours and spent more time looking at areas less likely to display change. Glaucoma likelihood agreement was higher for glaucoma specialist orthoptists ($\kappa = 0.51$) compared to novices ($\kappa = 0.31$).

Conclusion: Glaucoma specialist orthoptists adopt a systematic gaze behaviour when examining the optic disc for glaucoma and achieved higher agreement when determining glaucoma likelihood.

Keywords: eye tracking, gaze, orthoptists, glaucoma

INTRODUCTION

Glaucoma is currently the most common cause of irreversible blindness in the world.[1,2] The prevalence of glaucoma is predicted to increase in line with population growth[1] and by 2020 it is expected that almost 80 million people will be diagnosed with the disease worldwide.[1] The proportion of undiagnosed glaucoma reported in population-based surveys is high in both developed and developing nations[3-8] and is estimated at around 50% in Australia and Europe.[4,8,9] In lower income areas of Asia and Africa, the percentage is much higher, reaching up to 90%.[3,5,7]

Whilst glaucoma can remain asymptomatic, even in the presence of severe damage it is possible to detect changes at the optic nerve head before functional loss occurs.[10-12] This means that the accurate assessment of the optic nerve head is crucial for detecting early glaucoma and implementing appropriate treatment to manage the disease. Despite advances in quantitative technologies, the current standard practice in many other parts of the world is to clinically examine and subjectively record the appearance of the optic nerve head.[13-15] Most orthoptists have little experience in the screening and monitoring of patients suspected of or diagnosed with glaucoma, however, more recently orthoptists have extended their scope of practice and become involved in comprehensive glaucoma care.[16] Despite the growing role of orthoptists

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in the screening and monitoring of glaucoma patients in Australia and the United Kingdom, their ability to provide valid and efficient glaucoma care has not been investigated.[16,17]

Optic disc examination, the central skill in glaucoma diagnosis, has been shown to improve with clinical experience.[18-20] Research suggests that more experienced clinicians are able to accurately assess key morphological features of glaucoma and are more systematic and logical in their approach to scanning the optic disc for pathology.[15,19] However, there is currently a lack of peer reviewed literature exploring orthoptists' accuracy in detecting glaucomatous pathology despite their extended scope of practice in this clinical area. The use of eye tracking technology provides one way to examine the visual search strategy of clinicians, as related to optic disc examination, alongside investigating their diagnostic accuracy. It also provides an opportunity to detect discrepancies between clinicians of various levels of experience and the way in which they examine the optic nerve head. Therefore, the aim of this study was to examine the extent to which level of clinical experience of orthoptists influences eye movements, gaze behaviour and diagnostic accuracy when examining optic disc images for glaucoma.

MATERIALS AND METHODS

Participants

Clinical orthoptists in the state of Victoria, Australia, were contacted via email and invited to participate. A list of orthoptists was compiled using publicly accessible resources such as hospital registries, registration and professional bodies including the Australian Orthoptic Board and Orthoptics Australia.

Orthoptists who worked in a clinical setting were eligible for participation. These included orthoptists working in either ocular motility or general ophthalmology settings. Clinicians who had more than 12 months clinical experience working in a specialist glaucoma clinic and were involved in screening and monitoring glaucoma, were considered glaucoma specialist orthoptists for the purpose of this study.

At the time of recruitment there were approximately eight glaucoma specialist orthoptists practising in Victoria. The clinicians who did not meet the criteria for glaucoma specialist orthoptist were classified as novice orthoptists. Ethics approval was sought and granted from the La Trobe University Faculty of Health Sciences Human Ethics Committee (FHEC14/235). Written informed consent was obtained from all participants in accordance with the Declaration of Helsinki.

Optic disc images

The optic disc images included for eye tracking assessment were selected from a set of 2,500 high-resolution images of normal subjects and patients with glaucoma previously utilised in the Glaucomatous Optic Neuropathy Evaluation (GONE) project.[19] Twenty optic disc images which illustrated a range of optic disc appearances and varying levels of glaucomatous damage were carefully selected and validated by two experienced glaucoma specialist ophthalmologists. The characteristics of optic disc images selected, and their glaucoma likelihood rating, can be found in Table 1.

The selected optic disc images were stored as high-quality JPEG images and were standardised in size and magnification to fit to the Tobii T120 eye tracker screen resolution. Participants assessed each optic disc image and when finished were asked to classify the image using a four-point ordinal scale (unlikely, possible, probable or certain) for glaucoma likelihood.

Table 1. Optic disc characteristics and glaucoma likelihood of eye tracking images as assessed by glaucoma specialist ophthalmologists

Disc characteristics	Scale	Number of discs
Disc size	Hypoplastic Small Medium Large Macro	0 2 16 2 0
Disc shape	Regular Ovoid	9 11
Disc tilt	No tilt Tilt	17 3
Vertical CDR	<0.5 0.5 0.6 0.7 0.8 0.9 >0.9	2 4 3 4 3 4 0
Cup shape	Normal Concentric rim loss Superior rim loss Inferior rim loss Superior & inferior rim loss	10 1 0 7 2
Cup depth	Shallow Moderate Deep Undermined	7 9 4 0
Haemorrhage	Absent Present	18 2
Peri-papillary atrophy	Mild or None Moderate Extensive	11 7 2
Retinal nerve fibre layer loss	No loss Focal loss superiorly Focal loss inferiorly General loss	13 0 3 4
Glaucoma likelihood	Unlikely Possible Probable Certain	8 3 4 5

Eye tracking

The Tobii T120 eye tracker (Tobii Technology, Stockholm, Sweden) was used to record the eye movements and gaze behaviour. The eye tracker consists of a 17-inch, thin film transfer (TFT) monitor with a screen resolution of 1280 x 1024 pixels and has a data rate of 120Hz. The Tobii T120 is able to tolerate moderate head movements at 50 to 80cm in front of the screen without compromising data collection accuracy. This enables clinicians to be able to make slight adjustments to get a better view of the image, which mimics a normal clinical environment.

Before the commencement of data collection, participants were given verbal instructions about the procedure and how to conduct the experiment. Participants were seated 60 cm ± 10cm in front of the screen, as per the protocol described by Tobii Technology. A standard 5-point calibration was performed for each participant. A sample optic disc image was displayed before the commencement of the 20 test images to allow for participants to become familiar with the procedure. After the sample image, images were shown consecutively and in the same order for all participants. A maximum of 90 seconds was given to examine each image. Once satisfied with their examination, participants were instructed to click the attached mouse when they had completed their examination. Answers were verbally delivered to the researcher who entered them onto a paper proforma. Participants were given no further information about the patients' medical history, ophthalmic tests and were not given an image of the opposite eye for comparison. Eye movements were tracked from when the first fixation was made until the mouse was clicked.

Statistical analysis

The agreement on glaucoma likelihood between specialist ophthalmologists and each orthoptic group was estimated using a weighted kappa. The students t-test was used to compare agreement between orthoptist groups. Multivariable linear regression was performed to compare log-transformed values of total time taken (for each image), number of fixations and proportion of time spent fixating on areas of interest (AOI) between participant groups (glaucoma specialist orthoptists vs novice orthoptists) adjusting for likelihood of glaucoma. AOIs on optic disc images were defined by two glaucoma specialist ophthalmologists as areas of focal pathology and were inserted using the Tobii pro software. Gaze data were qualitatively analysed for each participant, taking note of gaze behaviour and patterns of fixations. Statistical significance was set at <0.05. Data were analysed using Stata/IC 13.1 (College Station, Texas).

RESULTS

Participant characteristics

Forty-one orthoptists agreed to participate in this study and undertook testing. The sample included five glaucoma specialist orthoptists and 36 novice orthoptists. Of the study population 42.9% had less than 5 years of experience as an orthoptist, 8.6% had 5-10 years, 25.7% had 11-20 years, 17.1% had 21-30 years and 5.7% had 30 or more years of experience. Over a third (37.1%) worked only in public ophthalmology clinics, 40% worked exclusively in private ophthalmology clinics, and 22.9% worked in both sectors. Four novice orthoptists were excluded from all analyses except for those relating to total time taken and glaucoma likelihood assessment. This was due to a high percentage of missing or unreliable eye tracking data for those four clinicians.

Optic disc assessment time

There was insufficient evidence for a difference in optic disc examination time between orthoptist groups. The total time for all included optic disc images was calculated to be 9.97 seconds (14%) greater for the expert orthoptist group than for the novice orthoptist group (95%CI -21% to +65%, p = 0.48). Similarly, no statistically significant relationship was evident between orthoptist groups, when images were grouped by glaucoma likelihood status. Figure 1 shows the median image assessment time for both expert and novice orthoptists for unlikely, possible, probable and certain glaucoma likelihood. Glaucoma specialist orthoptists spent 10.88 seconds (33%) (95%CI -3% to +82%), 8.08 seconds (25%) (95%CI -15% to +84%) and 9.75 seconds (12%) (95%CI -31% to +83%) longer to assess possible, probable and unlikely images respectively, and 1.03 seconds (1%) (95%CI -31% to +42%) less on certain images but this was not significant.

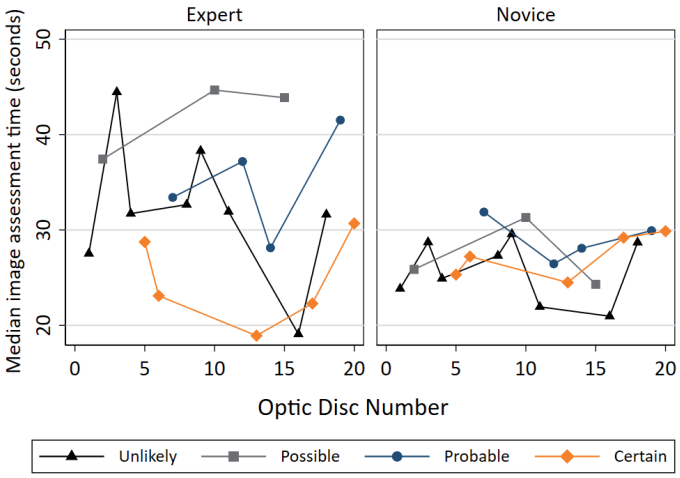

Figure 1. Median image assessment time (seconds) for novice and glaucoma specialist orthoptists for optic disc images.

Number of fixations

No significant relationship was found between orthoptist groups and the total number of fixations for all images. Glaucoma specialist orthoptists had a median of 5.4 (19%) more fixations across all images, (95%CI -15% to +67%, p = 0.30). The greatest difference in fixation count between orthoptist groups was for images with a glaucoma likelihood of 'possible'. Glaucoma specialist orthoptists had 29.16 (38%) more fixations when assessing possible images and this difference was statistically significant (95%CI +5% to +82%, p = 0.02). Figure 2 shows the median fixation count across all images for both orthoptist groups.

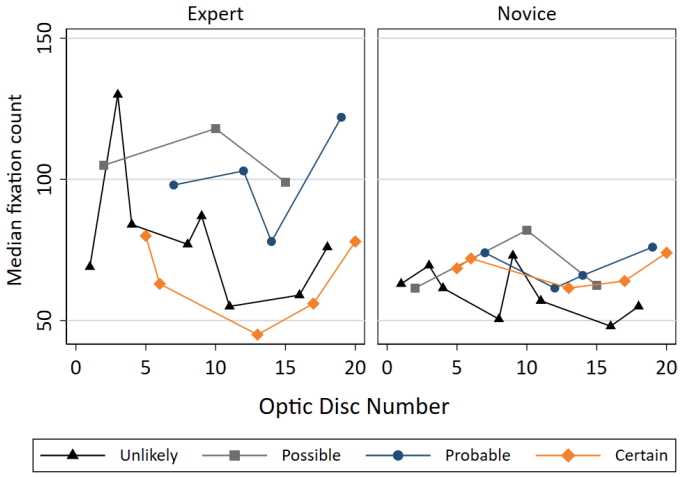

Figure 2. Median fixation count of expert and novice orthoptists for all optic disc images.

Fixation patterns

Three broad trends emerged from the qualitative assessment of the fixation patterns and gaze behaviour of orthoptists. One image from each disease status was randomly selected from the dataset to display the scan paths of orthoptists. Figure 3 displays the images without superimposed scan paths. Generally, the glaucoma specialist orthoptist group exhibited a methodical viewing pattern when assessing each optic disc. The experts examined the image by looking at regions more likely to show signs of glaucomatous damage such as the superior temporal and inferior temporal neuro-retinal rims and the retinal nerve fibre layer. The fixation pattern and gaze behaviour of expert orthoptists did not vary substantially by glaucoma likelihood status. The same methodical patterns were shown across all images. Figure 4 displays an example of the gaze behaviour and fixation pattern of two expert orthoptists whilst examining: unlikely, possible, probable and certain glaucomatous optic disc images.

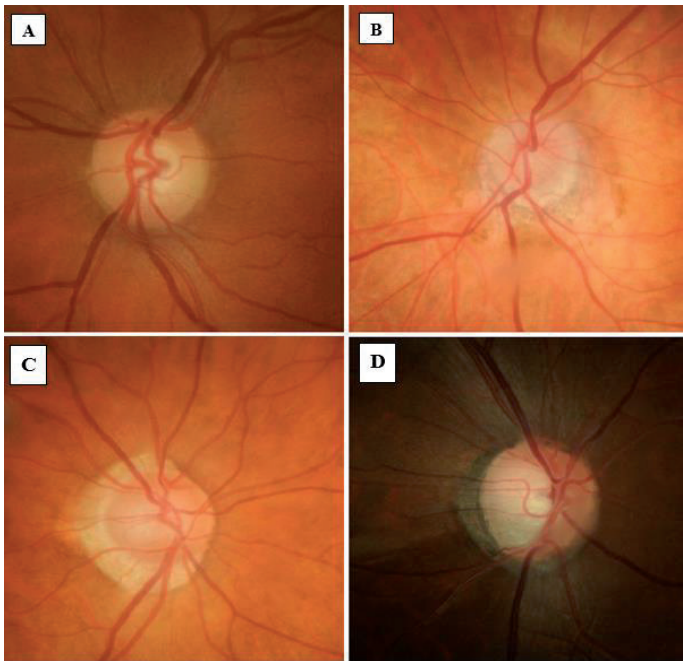

Figure 3. Sample images examined by orthoptists during eye tracking. Image A = unlikely to be glaucomatous; Image B = possible glaucoma; Image C = probable glaucoma; and Image D = certain glaucoma.

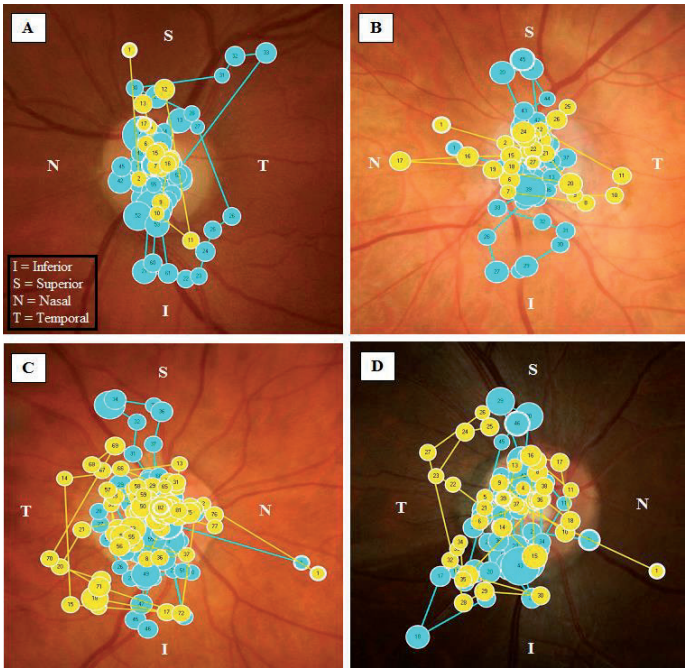

Figure 4. Tobii eye tracker scan paths of gaze behaviour and fixation patterns displayed by two expert orthoptists. Each colour represents a different orthoptist and numbers indicate the order of fixations. Participants were asked to assess optic disc images for signs of glaucoma, the images were given a glaucoma likelihood status of either unlikely (A), possible (B), probable (C) and certain (D) glaucomatous optic disc images.

Novice orthoptists did not exhibit the same methodical viewing pattern as glaucoma specialist orthoptists. Their gaze behaviour and fixation pattern were focused on the optic disc or displayed in a random pattern. For the group of orthoptists who focused on the optic disc, the fixations were predominantly located centrally on the optic disc. There were very few fixations made out into the superior and inferior retinal nerve fibre layer. Figure 5 displays an example of the gaze behaviour and fixation pattern of novice orthoptists who displayed the viewing pattern which focused primarily on the optic disc. For the orthoptists who displayed a random pattern, the fixations were mostly located centrally on the optic disc with large directional changes seen into areas of the retinal nerve fibre layer, which appeared to be random and spiral shaped. Figure 6 shows an example of the random gaze behaviour and fixation pattern displayed by novice orthoptists.

Time spent on areas of severe focal pathology

Of the included optic disc images, there were 11 AOIs across six images that displayed severe focal pathology. This included severe superior and inferior neuro-retinal rim thinning, notching, optic disc haemorrhages and retinal nerve fibre layer defects. Only one AOI exhibited a statistically significant difference between orthoptist groups. Specifically, novices spent significantly longer fixating on an area of inferior neuro-retinal rim thinning on Image 13 ($p = 0.03$) (Figure 7).

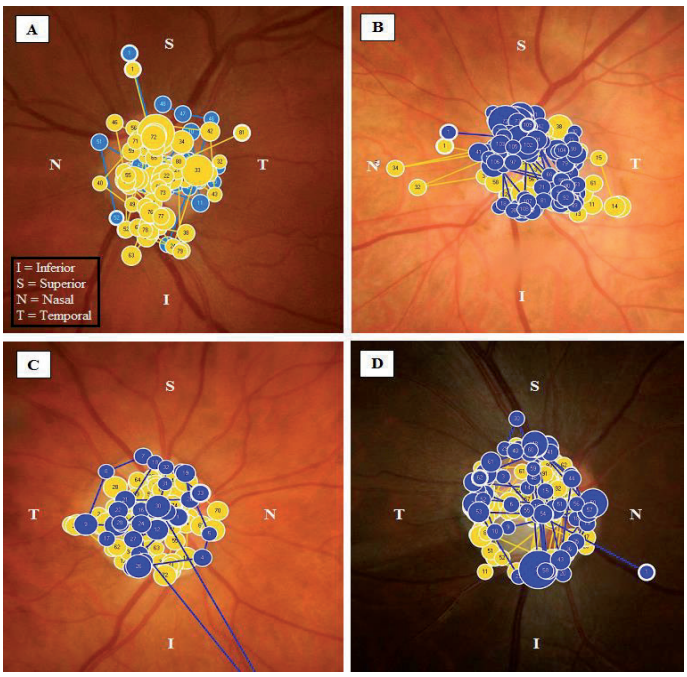

Figure 5. Tobii eye tracker scan paths of gaze behaviour and fixation patterns displayed by two novice orthoptists who displayed the viewing pattern which focused primarily on the optic disc. The images display the scan paths of unlikely (A), possible (B), probable (C) and certain (D) glaucomatous optic disc images.

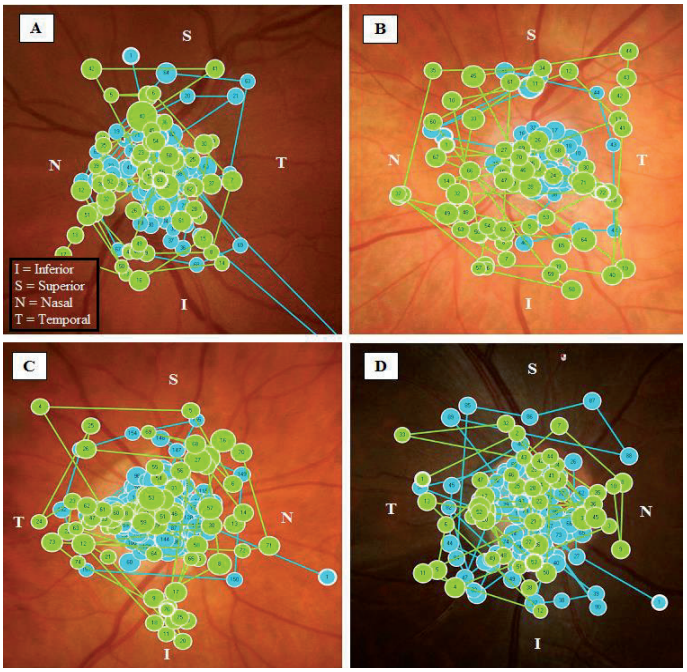

Figure 6. Tobii eye tracker scan paths of gaze behaviour and fixation patterns displayed by two novice orthoptists who displayed the random viewing pattern. The images display the scan paths of unlikely (A), possible (B), probable (C) and certain (D) glaucomatous optic disc images.

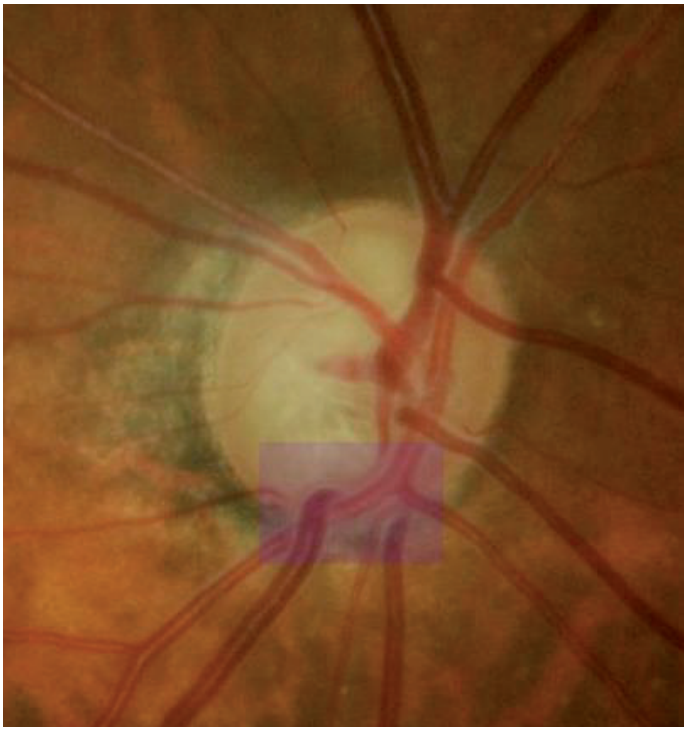

Figure 7. Image 13: Area of inferior neuro-retinal rim thinning shaded in purple.

Agreement on glaucoma likelihood

The agreement on glaucoma likelihood between glaucoma specialist orthoptists and the glaucoma specialist ophthalmologists was moderately strong (κ = 0.51) and fair for novices (κ = 0.31). Although agreement was higher among the glaucoma specialist orthoptists, the difference in kappa of 0.19 between groups was not statistically significant (95%CI -0.01, 0.39, p = 0.07). The variation in kappa scores between novices and glaucoma specialist orthoptists can be seen in Figure 8.

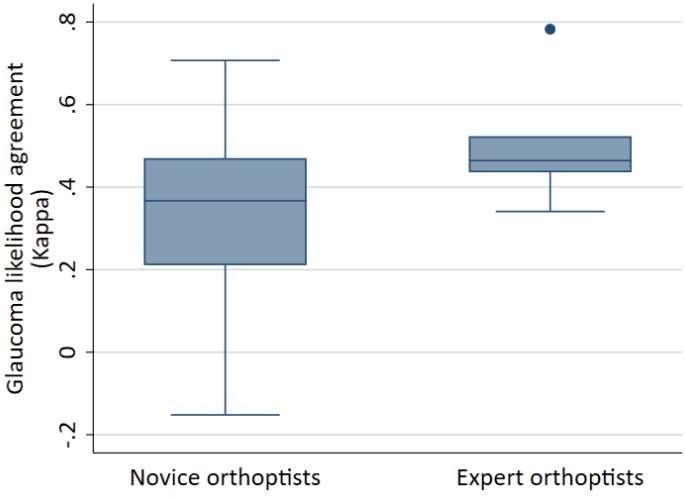

Figure 8. Box plot of the distribution of glaucoma likelihood agreement scores (kappa) for novice and glaucoma specialist orthoptists.

DISCUSSION

This investigation into the relationships between eye movements, gaze behaviour and accuracy in determining glaucoma likelihood by orthoptists with different levels of experience, revealed some novel findings. Orthoptists with greater experience in assessing patients for glaucoma demonstrated systematic eye movements and gaze behaviour across all levels of disease severity. The viewing patterns for experts were methodical, but they took longer to assess optic disc images and amassed a higher number of fixations. Novices displayed viewing patterns that were less predictable. At times they failed to scan within the retinal nerve fibre layer. A trend towards greater agreement was displayed by glaucoma specialist orthoptists when determining glaucoma likelihood and they were likely to be better equipped to confidently assess the optic disc for disease.

Current literature investigating eye tracking of clinicians with varying degrees of expertise when making a disease diagnosis primarily focuses on viewing radiological images. These studies have found that those with more experience make quicker assessments, fixate faster to a lesion site and make less fixations.[21-24] This is in contrast to the current study and may be explained by different level of experience of included clinicians and the type of tasks performed. For instance, Kok et al[22] compared disparate groups which included medical students and experienced radiologists. The clinicians in the current study are more closely comparable in regard to years of experience which may potentially explain the lack of statistically significant differences between the groups. In addition, clinicians in the current study were asked to make a diagnostic decision about glaucoma likelihood. This involved distinguishing between many potential ambiguous diagnostic features compared to identifying a single fracture which requires a less extensive visual search strategy.

Eye movements and gaze behaviour of ophthalmologists whilst examining the optic disc for glaucoma has been sparsely investigated. O'Neill et al[15] previously reported that glaucoma specialist ophthalmologists spend significantly less time examining optic disc images compared to trainee ophthalmologists. However, the eight images included for assessment all had diffuse or focal neuro-retinal rim loss which could potentially explain the disparate findings to the current study. The inclusion of optic disc images with severe forms of the disease could possibly inflate results, as advanced disease is easier to detect.[25] Glaucoma specialist ophthalmologists are highly experienced and are easily able to identify glaucomatous features, especially advanced pathology. This could help to explain the difference in examination times compared to trainee ophthalmologists.

Our finding that glaucoma specialist orthoptists displayed a methodical order of examination of the optic disc are in agreement with O'Neill et al.[15] Glaucoma specialist orthoptists showed comparable visual search strategies to ophthalmologists with sub-specialty training in glaucoma. They visualised common areas of pathology seen in glaucoma and did not spend time assessing areas unlikely to assist them with a diagnosis, such as the retinal periphery. This type of systematic search strategy has also been reported in the radiology literature and suggests a greater level of skill and knowledge.[23,24,26-28]

The search strategy displayed by some novice orthoptists has also been displayed by trainee ophthalmologists.[15] This gaze behaviour has been attributed to inexperience regarding the characteristic features of glaucomatous damage. In addition, studies which have investigated the detection and interpretation of chest lesions have found that clinicians with less experience exhibit a central search strategy and focus within one region repetitively.[29,30] The random pattern displayed by novices in our study has also been noted by novices when searching for chest or lung lesions in studies by Donovan and Litchfield[31] and Kok et al.[27] Both noted that novice clinicians tend to focus on areas of low probability for containing pathology. They also

cover more areas of the image due to lack of experience in knowing where to look and what to look for. Greater visual search efficiency and less distribution of fixations displayed by experts in the current study was likely due to more comprehensive training and greater experience in assessing optic discs for glaucoma.

There are several limitations of the current study which warrant further consideration. Firstly, the small number of glaucoma specialist orthoptists likely resulted in a lack of statistical power to show differences between the groups. Furthermore, participants in the novice group were not categorised based on their years of clinical experience. It is possible that orthoptists who were trained before the introduction of general ophthalmology training in University courses could have used different methods of scanning and have less knowledge about glaucomatous disease processes than more recent graduates. Finally, monoscopic images were utilised which may have impacted orthoptists ability to perceive three dimensional structures such as the optic cup.

CONCLUSION

To conclude, this study is the first of its kind to investigate the eye movements, gaze behaviour and accuracy of orthoptists when performing optic disc examinations for glaucoma. Overall, glaucoma specialist orthoptists displayed more efficient eye movements and gaze behaviour. These findings provide some support for the use of experienced glaucoma specialist orthoptists in the assessment of the optic disc in glaucoma, however, future research which includes a greater number of glaucoma specialist orthoptists from outside of Victoria is required to further strengthen these findings.

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Orthoptics Australia Workforce Survey 2017

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ABSTRACT

Purpose: This paper presents the results of the 2017 Orthoptics Australia Workforce Survey (OWS). The results are compared and contrasted with the outcome of the previous 2012-2013 OWS.

Method: The 2017 OWS was implemented using the online tool - SurveyMonkey. All financial members of Orthoptics Australia were contacted to participate in the OWS. To achieve maximum uptake, non-OA members were also encouraged by colleagues to participate in the workforce survey, through publicity at annual conferences and via social media.

Results: Three hundred and twenty-eight orthoptists responded to the 2017 OWS. The profession continues to be female dominated (88.7%), with a young workforce (49.9% between 20-39 years), and high levels of Australian nationality (94%). Most respondents (79.9%) worked in metropolitan NSW (46.7%) or Victoria (31.1%). The main components of current orthoptic employment included public sector (24.9%) and salaried positions in the private sector (52.5%), with 89.5% working in orthoptic related clinical work. Levels of satisfaction with current hours of work were high (91.3%), with 56% indicating their intention to continue to work in an orthoptic-related field for more than the next 10 years.

Conclusion: The 2017 OWS provides a broad overview of the current orthoptic workforce and modes of practice in Australia. These comprehensive survey results can be applied to workforce development, and are available to government and health bodies for future eye health care planning.

Keywords: orthoptics, workforce, survey

INTRODUCTION

The Australian orthoptic workforce plays a vital role in the provision of eye health care services to a population that is diverse in age, health and disability. As identified in the 2012-2013 Orthoptics Australia Workforce Survey (OWS),[1] Australia is faced with managing the health demands and associated costs of an ageing population. The Commonwealth of Australia[2] has predicted that by 2032 the Australian population will increase by 27% to approximately 25 million, with people over the age of 55 years doubling to 8.9 million. Vision 2020 Australia[3] reported on the economic impact of vision loss in Australia, with the direct cost of treating eye disease being AU$2.98 billion, and the allocated health expenditure on eye conditions growing in real terms by approximately 4.8% per annum. This report further estimated a parallel increase in age-related eye disease in the ageing Australian population, with the most prevalent conditions being age-related macular degeneration, glaucoma and cataract in people aged over 40 years.

In 2017 Orthoptics Australia (OA) developed and implemented a workforce survey to report on contemporary Australian orthoptic practice, by exploring demographics, education levels, employment, student education involvement, and nature of clinical practice. This paper reports detailed outcomes on each area and discusses changes in the profession since the OWS conducted in 2012-2013. The findings also highlight the capacity of the Australian orthoptic workforce to respond to predicted eye health care needs.

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METHOD

All 2017 financial members of OA (n=470) were contacted via email to participate in the 2017 OWS; orthoptic students were excluded. As membership of OA is voluntary, the number of respondents to the 2017 OWS did not represent all orthoptists in the workforce. To achieve maximum uptake of the survey, non-OA members were encouraged by colleagues to participate in the 2017 OWS, through publicity at annual conferences, state OA events and on social media platforms. Access to an individual survey attempt could not be shared with multiple participants, thus limiting participation to one response per person.

The 2017 OWS was implemented using the online survey tool, SurveyMonkey.[4] The 2017 OWS aimed to collect data on the demographics, academic qualifications, employment patterns and professional practice of orthoptists working in Australia. The 2017 OWS was pretested by a working party prior to release, and contained quantitative and qualitative questions that allowed comparison to the 2012-13 OWS. The 2017 OWS consisted of 68 questions that required participants to respond using a Likert scale, or to provide descriptive responses/opinions (Appendix 1). No questions were compulsory, and participants were free to choose the questions they wished to answer. Data were collected from 1 July 2017 to 31 December 2017, with four email reminders sent to all members during this time. Descriptive statistical analysis of the 2017 OWS was conducted using the data analysis tool embedded in SurveyMonkey.

RESULTS

A total of 328 orthoptists responded to the 2017 OWS including 291 OA members, and 31 non-OA members; 6 respondents did not indicate their membership status. The OA members who responded represented 70% of the OA financial membership at that time. The minimum response rate to all questions in the survey was 85%.

Demographics

In response to gender, 289 (88.7%) respondents identified as female and 37 (11.3%) identified as male. This reflected a slight reduction in females and an increase in males from the 2012-13 OWS (90.6% and 9.4%, respectively). Age was reported by 327 respondents with an overall age range from 20 years to greater than 60 years (Table 1). Compared to the 2012-13 OWS a reduction in respondents aged 20-29 years occurred, however, an increase in the 60 years and over age range was evident.

Table 1. Respondent ages

	2017 OWS (n = 327)	2012-2013 OWS (n = 415)
20 to 29 years	84 (25.7%)	158 (38.1%)
30 to 39 years	79 (24.2%)	97 (23.4%)
40 to 49 years	65 (19.9%)	75 (18.1%)
50 to 59 years	56 (17.1%)	66 (15.9%)
60 years and older	43 (13.2%)	13 (3.1%)

Nationality was provided by 310 respondents, with 306 (98.7%) indicating Australian nationality and 4 (1.3%) New Zealand nationality. Of the 310 respondents some also indicated dual nationality with Australia and countries such as the United Kingdom, Lebanon, Iran, Poland, United States of American, Nepal, India, Indonesia and Malaysia. Respondent nationality was not questioned in the 2012-13 OWS, so no comparison was possible.

The majority of respondents, 225 (77%) indicated that they were employed in NSW or Victoria. Table 2 shows the respondent's state or territory, with a slight increase in respondents in South Australia, Western Australia and the Australian Capital Territory since the 2012-13 OWS.

Table 2. Respondent state or territory

	2017 OWS (n = 293)	2012-2013 OWS (n = 398)
NSW	135 (46%)	195 (47%)
Victoria	90 (31%)	144 (34.7%)
Queensland	23 (7.8%)	28 (6.7%)
South Australia	14 (4.7%)	8 (1.9%)
Western Australia	14 (4.7%)	11 (2.7%)
Australian Capital Territory	10 (3.4%)	6 (1.4%)
Tasmania	6 (2%)	6 (1.4%)
Northern Territory	1 (0.3%)	0

Education

Over several decades the academic qualifications of orthoptists have evolved from a diploma to a graduate entry master's degree. The 2017 OWS collected details of initial orthoptic qualifications, subsequent academic qualifications and higher degrees. The 2017 OWS results indicated that 76 (24.4%) of the respondents qualified as an orthoptist with a master's degree, an increase from the reported 12.8% in 2012-13. In the 2017 OWS, 135 (43.3%) respondents qualified with a bachelor's degree, which was a reduction from the 2012-13 OWS finding of 49.4%.

Respondents who graduated with either an associate diploma or diploma numbered 102 (32.4%), increasing from the 27.7% reported in the 2012-13 OWS. One hundred and sixty (51%) respondents reported gaining their

qualifications in NSW and 136 (43%) in Victoria; this aligned with the 2012–13 OWS findings of 51.6% qualifying in NSW and 44.1% qualifying in Victoria. Twenty-one (6%) indicated they gained their orthoptic qualifications overseas, a slight increase from the 4.3% reported in the 2012–13 OWS.

Seventy-seven (34%) respondents indicated their initial academic qualification for entry into a Master of Orthoptics. Sixty (77.9%) reported holding a bachelor's degree in science including health sciences, medical science and general science. Other initial bachelor's degrees included optometry, psychology, arts, education, accounting, forensic biology and one respondent held a Master of Clinical Epidemiology. Further, participants were asked to identify their additional tertiary qualifications, related to or independent of orthoptics. Ten respondents (3.1%) identified they held a PhD; 109 (33.6%) held a master's degree; 141 (43.5%) held a bachelor degree; and 64 (19.8%) held either a diploma or associate diploma.

Current employment

Work sector

Two hundred and ninety-five respondents indicated that they were currently working in an orthoptic-related field and of these, 264 (89.5%) were involved in clinical practice. The main components of clinical practice included 156 (52.4%) salaried positions in the private sector, and 74 (24.9%) in public sector employment. Other areas of employment included contractor in the private sector (10.8%); self-employed (5.7%); locum (6.4%); education (6.1%); research (6.4%); non-government agencies (5.7%); and industry (1.0%).

Work location

Of those currently employed, 235 (79.9%) practised in a metropolitan area, 41 (17.4%) practised in a regional area and 7 (2.4%) practised in a rural/remote area; these findings were very similar to the 2012–13 OWS. The nature of employment was questioned, with 244 (84.4%) respondents indicating they were permanently employed; 30 (10.4%) reporting casual employment; and 15 (5.2%) employed on a temporary basis.

Work hours

Of those currently employed, 187 (62.5%) indicated that, on average, they worked greater than 25 hours per week. Sixty-five (21.8%) indicated that they worked on average between 12 and 25 hours. Satisfaction with the current hours of work was high with 274 (91.3%) indicating that they were satisfied with their job and the hours it offered; this was a similar finding to the 2012–13 OWS, where 89.8% indicated satisfaction with their employment hours. Respondents were asked if they would prefer to be employed more hours than their current situation. Two hundred and fifty-five (86.2%) respondents did not want to be employed additional hours per week.

Projected Work Attrition

One hundred and sixty-six (56%) respondents indicated that they were likely to continue to work in an orthoptic-related field for greater than ten years; 64 respondents (21.6)% indicated that they would continue for up to five years; and 66 respondents (22.3)% indicated between five and ten years.

Workplace staff mix

Respondents were asked to identify the nature of the staff mix in their workplaces, including qualified and unqualified staff. In addition to orthoptists, ophthalmologists and ophthalmic registrars, eyecare workplace staff mix included optometrists (60), ophthalmic nurses (100), qualified ophthalmic technicians (31), unqualified ophthalmic workers (50), vision scientists (13), and optical dispensers (9).

Involvement in student clinical education

At the time of the 2017 OWS, 161 (55%) respondents indicated they were in involved in the clinical supervision of orthoptic students in their workplace; this showed increased involvement from the 44.1% finding from the 2012–13 OWS. The 132 (45.1%) respondents who were not involved in orthoptic student education indicated a variety of reasons for non-participation including time restrictions imposed by their clinical workload, a lack of clinical space to accommodate a student, remoteness from the tertiary institution, irregularity of clinical sessions, and that they were not currently involved with the academic institutions.

Nature of clinical practice

Respondents were asked to identify all areas of clinical practice related to their current employment and were free to select more than one response from a list of categories. Three hundred and twenty-four (99%) respondents identified they were involved in traditional orthoptic practice areas including ocular motility, paediatrics and neuro-ophthalmology. In the area of general ophthalmology, 296 (91%) respondents indicated that they were involved in areas such as surgical assisting and refractive surgery, an increase on the 75.4% who indicated working within the general ophthalmology sector in the 2012–13 OWS. Other respondents indicated practice in low vision (57), education (47), research (35) and rehabilitation (25).

Respondents were asked to identify their participation in conducting specific clinical tests. These included medical history taking, visual acuity assessment, ocular motility assessment, ophthalmic testing and specialised screening, eg glaucoma screening (Table 3).

Table 3. Participation in specified areas of clinical practice			
	Assessed on every patient	Assessed as needed	Never assessed
Medical history taking	152 (53%)	132 (46%)	5 (1%)
Visual acuity assessment	272 (95.1%)	14 (4.9%)	0
Ocular motility assessment	51(17.8%)	208 (72.5%)	28 (9.8%)
Ophthalmic testing	122 (43%)	127(44.7%)	35 (12.3%)
Specialised screening	38 (13.4%)	198 (70%)	47 (16.6%)

Independent orthoptic practice

One hundred and sixty respondents reported an involvement in independent orthoptic practice. Of these, 127 (79%) identified a variety of roles including paediatric triage, strabismus and amblyopia management, outreach vision screening, glaucoma monitoring, electrophysiology, pre and post-operative cataract care and refraction, low vision; rehabilitation, diabetic screening and ocular screening for adverse drug effects.

DISCUSSION

The results of the 2017 OWS presented in this paper provide an overview of contemporary Australian orthoptic practice. Whilst this survey was limited by the number of respondents, the results have been compared to the outcomes with the previous survey conducted in 2012-2013. As highlighted in the 2012-13 OWS,[1] determining the number of orthoptists working in Australia continues to be challenging. OA membership is not compulsory for practising orthoptists and in the case of the 2017 OWS, only 70% of current financial OA members participated. However, by comparing Australian census data from the 2011 Australian Census[1] (where 678 repondents indicated their profession as orthoptics), to the most recent census in 2016 (where 834 repondents indicated their profession as orthoptics) (Kiriakidis L, personal communication, 10 September 2018), a 19% increase has occurred, indicating a continued and steady growth in the profession.

The pattern of an Australian female-dominated orthoptic workforce continues, with the gender distribution between male and female similar to the 2012-13 OWS.[1] However, with the expansion of career options and clinical practice areas, the opportunity to increase gender equity could be a future focus for the profession.

The age distribution of the respondents in the 2017 OWS proved similar to that reported in the 2012-13 OWS.[1] In 2017, approximately 70% of respondents were under 50 years of age, with 48.9% of the respondents being younger than 40 years of age. This highlights that orthoptics is sustained by a relatively young workforce, particularly as only 13.2% of the respondents were greater than 59 years of age. The impact on the provision of orthoptic services across Australia with the future retirement of this small group should be minimal. Further, 50% of respondents indicated that they intended to continue in the profession for more than ten years. These numbers also support a strong workforce.

The trend for the majority of orthoptists to work in NSW and Victoria in metropolitan areas continues when compared to the 2012-13 OWS.[1] Workforce shortages are reported in rural and remote areas, and states other than NSW and Victoria. In addressing this issue, Australian universities have encouraged orthoptic students to complete clinical training outside of metropolitan areas to broaden their post-university outlook on potential areas of employment. Also, OA continues to have involvement in opportunities that promote the profession more broadly.

The results of the 2017 OWS reveal that the orthoptic workforce is highly educated with more than half of the respondents holding a bachelor and/or master's degree, and ten respondents holding a PhD. Additionally, an increase in the number of orthoptists with non-orthoptic higher qualifications was evident.

An interest in the continuity of the profession was apparent from the number of respondents who indicated their commitment to the education of orthoptic students, with 55% of the respondents involved in supervision of students in their workplaces.

The 2017 OWS revealed a sound level of satisfaction regarding employment levels within the current Australian orthoptic workforce. Sixty-three percent of orthoptists worked more than 25 hours per week, with 86% satisfied with their current work hours. Ninety-one percent reported that they were satisfied with their current job. It was interesting to note the workplace staff mix reported by respondents in the 2017 OWS, with a variety of qualified and unqualified staff holding roles in Australian eye health care.

In an environment where health economics demand efficiencies and increased productivity, orthoptists are cost-effective health providers with the capacity to co-manage chronic eye disease in private and public, primary and tertiary systems. The 2017 OWS shows that orthoptists are well placed to significantly contribute to caring for the ageing Australian population. The 2017 OWS reveals an orthoptic workforce that has a sound educational foundation, and a profession that has evolved areas of advanced orthoptic practice to meet emerging needs, such as glaucoma and cataract monitoring. These findings can be used to underpin future health planning, to ensure comprehensive and timely eye care for all Australians.

Study strengths and limitations

By nature of surveys, the capacity to report is limited by the number of respondents and the questions they choose to answer. Given the number of respondents represented 70% of the OA financial membership in 2017, and the minimum response rate to all questions in the survey was 85%, the authors believe the 2017 OWS outcomes are representative of contemporary Australian orthoptists.

CONCLUSION

The results of the 2017 OWS have revealed that Australian orthoptists hold vital roles in a competitive, multidisciplinary environment, one that is characterised by a staff mix of colleagues who hold a variety of qualifications. The orthoptic workforce is well suited for this role, with high levels of tertiary education including higher degrees and PhDs, and a diverse knowledge base seen in the entry level degrees held by members. Orthoptists have shown their commitment to investing in the future of orthoptics, with over half indicating their involvement in student clinical education. Australian orthoptists therefore continue to meet the evolving demands of current and future primary and tertiary eye health care.

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Appendix 1. Questions included in 2017 Orthoptics Australia Workforce Survey
Q1. What is your nationality?
Q2. Please indicate your age by selecting one of the age ranges below.
Q3. Please indicate your gender.
Q4. Do you speak a language other than English in your workplace?
Q5. What was your initial qualification in Orthoptics?
Q6. Please indicate where you gained your initial orthoptic qualification.
Q7. If you hold a Master of Orthoptics, please indicate the initial degree that contributed to you successfully gaining enrolment in the masters program.
Q8. Please indicate the number of years since you graduated as an orthoptist.
Q9. Do you hold any other tertiary qualifications in Orthoptics or other fields?
Q10. What is your current highest tertiary qualification?
Q11. Are you a member of Orthoptics Australia?
Q12. Are you registered with the Australian Orthoptic Board?
Q13. Do you plan to apply for a Certificate of Currency in this coming biennium 2017-2019?
Q14. Are you registered as a Medicare provider?
Q15. Are you registered as a National Disability Insurance Scheme provider?
Q16. Are you registered as a private health insurance provider?
Q17. Are you registered with the Department of Veteran Affairs for the provision of services?
Q18. Do you have your own personal indemnity insurance policy, i.e. you do not rely on your employer's indemnity insurance?
Q19. Do you hold membership or registration with any of the following organisations?
Q20. What was the nature of your first job?
Q21. Approximately how long did you remain in your first job?
Q22. Did you move from your home state to gain a job as an Orthoptist?
Q23.Please answer this question if you are currently working in an orthoptic related field. Please indicate which area you are currently working in.
Q24. Please answer this question if you are not working in an orthoptic related field. Please indicate the main reason why you are not currently working in an orthoptic related field.
Q25. Please answer this question if you are not working in an orthoptic related field. Do you plan to return to working as an orthoptist?
Q26. Please select from the list below those areas that you work in each week.
Q27. Please indicate the average number of hours per week that you currently work as an orthoptist.
Q28. Would you prefer to be employed more hours than your current situation?
Q29. What attracted you to your current position?
Q30. Please indicate your current level of satisfaction in relation to your job and the capacity it offers you to utilise your skills.
Q31. Please indicate your current level of satisfaction in relation to your job and the variety of work it offers you.
Q32. Please indicate your current level of satisfaction in relation to your job and the capacity it offers you to have sufficient work to maintain competency in your role as an orthoptist.
Q33. Please indicate your current level of satisfaction in relation to your job and the hours of work it offers you.
Q34. Please indicate your current level of satisfaction in relation to your job and the daily workload you are responsible for.
Q35. Please indicate your current level of satisfaction in relation to your job and the capacity it offers you for career progression.
Q36. How many years are you likely to work in an orthoptic related field?

Q37. Please answer this question if in the last 12 months have you taken more than 3 months off from orthoptic related work for any reason. Please indicate your primary reason.
Q38. Would you consider moving to a rural area or interstate for an orthoptic related role?
Q39. Have you ever worked overseas as an orthoptist?
Q40. In your workplace is there an unmet need for orthoptists? For example, your workplace has been unable to fill orthoptic positions.
Q41. Please indicate which state/territory you are currently working in.
Q42. Do you work in more than one location in your main job?
Q43. What is the location of your main job?
Q44. If you answered metropolitan for the location of your main job, please answer this question. Did you grow up in a metropolitan area?
Q45. If you answered metropolitan for the location of your main job, please also answer this question. Do you intend to remain in a metropolitan area for the next 5 years?
Q46. If you answered regional or rural/remote for the location of your main job, please answer this question. Did you grow up in a such an area?
Q47. If you answered regional or rural/remote for the location of your main job, please also answer this question. Do you intend to remain in this regional or rural/ remote area for the next 5 years?
Q48. How would you best describe the main component of your current orthoptic employment?
Q49. How would you describe the nature of your current employment?
Q50. How would you describe the clinical area of your main current employment?
Q51. In your current employment, please indicate your involvement with research.
Q52. Please answer this question if you are involved in research in your current employment. Please tick which options best describe your role in research.
Q53. Are you involved in orthoptist led clinics, i.e. clinics where patients are reviewed solely by the orthoptist?
Q54. Which other eye health professionals work in your current workplace?
Q55. Please indicate from the list below other practice staff who perform investigation and treatment in your workplace.
Q56. What is the most common patient age range that applies to your job?
Q57. Do you supervise orthoptic students in your current workplace?
Q58. In a clinical session where you see patients, how often do you take a medical history?
Q59. In a clinical session where you see patients, how often do you assess visual acuity?
Q60. In a clinical session where you see patients, how often do you assess ocular motility?
Q61. In a clinical session, how often do you conduct ophthalmic testing?
Q62. In a clinical session where you see patients, how often do you conduct specialised screening, e.g. paediatric screening , glaucoma screening
Q63. Please indicate your current income bracket.
Q64. Have you participated in any of the following activities over the past 12 months?
Q65. Are you continuously developing your clinical knowledge and skills?
Q66. What do you perceive the role of Orthoptics Australia is in your professional development?
Q67. Do you perform any volunteer work related to eye health?
Q68. What do you perceive are the main challenges facing the profession of Orthoptics in Australia?

Selected Abstracts from the Orthoptics Australia 76th Annual Scientific Conference held in Sydney, 9th to 11th November 2019

PATRICIA LANCE LECTURE HOW DO WE KNOW WHAT WE KNOW, AND WHO KNOWS THAT WE KNOW IT? EVIDENCE-BASED ORTHOPTIC PRACTICE

Myra McGuinness

In the current environment of competing workforces, changing legislation and increasing litigation, evidence-based orthoptic practice is more important than ever. By striving for the highest level of clinical care, the orthoptic profession becomes empowered, benefits flow to employers and the healthcare system and, most importantly, patient outcomes improve. This lecture will highlight the importance of evidence-based orthoptic practice, examine barriers and explore systems for implementation in the workplace.

MANAGING REFERRALS AND THE DISCHARGE OF PATIENTS IN A BUSY PAEDIATRIC EYE CLINIC

Nicole Carter

With the demand for appointments at the Children's Hospital at Westmead continually increasing, implementing strict triage criteria for accepting new patients and for discharging current patients from the service, has become a top priority. This presentation outlined the criteria and processes the orthoptic department uses to make these decisions and to ensure clinic numbers and appointment wait times are appropriate.

ORTHOPTIST-LED NEUROFIBROMATOSIS TYPE 1 CLINIC AT THE ROYAL CHILDREN'S HOSPITAL, MELBOURNE: A STRATEGY FOR IMPACT

Navdeep Kaur, Catherine Lewis, Gabriel Dabscheck, Jonathan Ruddle

Neurofibromatosis Type 1 (NF1) is a common disease affecting 1 in 3000 individuals in Australia, with diverse complications affecting multiple organ systems. Up to 20% of NF1 patients develop an optic pathway glioma (OPG) resulting in vision loss. Patients with NF1 are often asymptomatic, as young children do not readily complain of impaired visual acuity, abnormal colour vision or visual field loss. Less than 50% of OPGs in NF1 patients become symptomatic. To minimise vision loss, ocular screening is imperative for prompt diagnosis and intervention.

Studies comparing screening strategies of NF1 centres in Europe and the USA identified a lack of uniformity in the frequency of reviews, duration of screening and ocular testing. To address the pressing need for a structured screening program at the Royal Children's Hospital (RCH) and to provide a streamlined clinical service, the RCH orthoptist-led NF1 screening clinic was implemented in 2016. This collaboration between the departments of ophthalmology and neurology at the RCH was developed for children diagnosed with NF1 and no known OPGs. Using evidence-based research from both departments, a strict protocol was designed.

Since implementation, the average ophthalmology consultation time reduced from 3 hours to 20 minutes and is completed without the use of dilating eye drops. Additionally, patients attend the NF outpatient clinic on the same day, requiring fewer trips to the hospital. This clinic has created uniformity in NF1 ocular testing, provided regular appointment reviews, and increased clinic capacity and efficiency.

THE CHALLENGES AND TRIUMPHS OF IMPLEMENTING EMERGING TECHNOLOGIES INTO PAEDIATRIC PRACTICE

Louise Brennan

Over time we have seen a changing health profile of children with more complex medical and behavioural needs presenting to the Eye Clinic at The Children's Hospital at Westmead. This, along with the utilisation of improved emerging technologies giving better visual outcomes, means that children remain within the eye clinic service for longer, require more visits and each visit takes more time. Increasingly the complex paediatric ophthalmic cases we now manage require a much more sophisticated assessment and evaluation. New technology sees multimodal imaging now a normal routine part of a clinic visit.

The push for younger patients to have non-invasive multimodal testing performed in the clinic is ever increasing to firstly gain quality images to help facilitate best care and secondly to avoid or reduce the number of examinations under anaesthetic.

Substantial change in clinical practice requirements are now needed by the paediatric eye team to deal with the use of emerging technologies including work practices, staffing levels, and enhanced skill sets. The paediatric orthoptist is well placed to be front and centre of this change in clinical care. The challenges along with the triumphs of this new role in clinical care was discussed.

10 YEARS ON … I AM OLDER BUT AM I WISER?

Lindley Leonard

Orthoptic-led clinics are continuing to be an important facet of best patient care at The Children's Hospital at Westmead. With the increased demand on services, thinking outside traditional models of care ensures appropriate use of public hospital resources. Ten years since the inception of our strabismus screening clinic, it is timely to review our service, the long-term validity, its success and its challenges.

MY YOUNG PATIENT HAS POOR VISUAL RESPONSES, WHERE TO FROM HERE?

Alison Byrne, Harzita Hashim

The cause of vision impairment can sometimes take time to diagnose in young children under the age of 3 years. However, these children often present with poor visual responses or atypical visual behaviour that suggests their vision may not continue to develop as expected. A significant amount of development occurs up to the age of 5 years and many of the skills children develop in this period of time lay the foundation for their future learning. Vision plays a significant role in early childhood development and a reduction in visual functioning can have an impact on all areas of development. This presentation highlighted the importance of eye clinics linking young children, who have reduced visual responses, with early intervention services, even before a confirmed diagnosis has been made. Case studies demonstrated how early intervention can improve the outcomes for children who are blind or have low vision.

LOOKING BACK FROM THE FUTURE - A REFLECTION ON ADVICE, PREDICTIONS AND THE OUTCOME

Cathie Wiltshire

A look back at a particular clinical case requiring corneal surgery, and the outcome – 20 years later. Was it what we had predicted? With our best intentions, guided by experience and knowledge, supported by ophthalmologists and other cases that have gone before, we make recommendations and predictions on clinical and functional visual outcomes. We advise families what their children may or may not be able to achieve – not to stifle them, but to put some sort of perspective and support networks there for the families. But what really happens? Do we get it 'right?' Is there a 'right'?

DELAYED DIAGNOSIS OF BRAIN TUMOURS IN CHILDREN

Agneta Rydberg

Introduction: Doctor´s delay in diagnosing paediatric central nervous system (CNS) tumours is a serious problem. Often various visual disturbances are the initial clinical signs and the tumours are life and sig ht threatening.

Material: Five children with early visual symptoms and with delayed diagnosis of CNS tumours were presented. The age of the children at diagnosis was 5½ to 9 years. Once the tumour was diagnosed neurosurgery and complementary treatment was initiated. However, the visual impairment was permanent.

Conclusion: Unexplained visual loss in paediatric populations must be investigated promptly. A complete neuro-ophthalmological investigation must be performed including visual field examination. Early diagnosis is essential in order to preserve existing visual functions.

'WON'T SOMEBODY PLEASE THINK OF THE CHILDREN?'

Premkumar Gunasekaran, Christopher Hodge, Gary Browne, Clare Fraser, Kathryn Rose

Aim: This retrospective study aims to determine how post-concussive vision problems in children impacts their symptom recovery.

Methods: Medical information from a paediatric sports concussion clinic in Sydney, was collected from November 2015 to May 2018. This included 142 patients with a medical diagnosis of concussion. Information analysed included age, sex, duration of symptomology, activity withdrawal, and the number of previous concussions. The Vestibular/Ocular Motor Screening (VOMS) test was used to determine concussion-related visual dysfunction.

Results: The mean age of subjects was 13.2 ± 2.6 years with 103 males and 35 females. Of these, 28% had a positive result on the VOMS test. Almost double the proportion females (42%) had a positive VOMS result compared to males (23%, $p=0.034$). Contact sports accounted for 58% of the concussions documented, with the highest prevalence (32%) in rugby. No association was found between VOMS result and age ($p=0.091$), occurrence of multiple concussions ($p=0.222$), or number of previous concussions ($p=0.187$). Ninety-three patients recovered from their concussion symptoms (median=33 days, IQR=21-71) while those with a negative VOMS had a 40% shorter mean recovery time (39.2 days) than those with a positive VOMS (63.7 days, $p<0.001$).

Conclusion: In children, visual dysfunction may be an important indicator of the time to recovery from concussion-related symptoms.

POST STROKE VISION CARE IN NSW: WHAT ARE THE CARE PATHWAYS AND ARE THEY WORKING?

Shanelle Sorbello, Amanda French, Kathryn Rose

Introduction: Visual impairment occurs in approximately 60% of stroke survivors. It often compounds the effect of age-related eye conditions and can greatly hinder successful rehabilitation overall. This study aims to evaluate the feasibility of surveys to investigate vision care pathways of stroke survivors in NSW and report preliminary findings.

Methods: Surveys were designed to investigate the major components of vision care, being the screening/assessment, management, referral, and education of stroke survivors in NSW. The experience and perspectives of health professionals and stroke survivors in NSW were gathered via the health professional survey (HPS) and stroke survivor survey (SSS), respectively. Survey feasibility was investigated using a mixed methods design. Preliminary data from both participant groups was analysed according to the three major components of care.

Results: Preliminary findings suggest that both surveys are of a reasonable length/time, widely understood by a variety of health professionals/stroke survivors, and address the major components of care. Care pathways of stroke survivors within NSW appear to be quite variable, with the success of each stage depending largely on timing and access to information and appropriately trained professionals.

Conclusion: The preliminary survey evaluation demonstrated that with minor refinements the survey tools are feasible and reliable. Results from both participant groups indicate a deficiency in most of the major post-stroke vision care components. The satisfaction of stroke survivors with their vision care seems to depend on the impact of the impairment on their daily life.

IMPROVING THE EXPERIENCE OF PEOPLE WHO ARE BLIND, HAVE LOW VISION OR DIPLOPIA WHILE THEY ARE IN HOSPITAL: AN EXPERIENCE BASED CO-DESIGN PROJECT

Kathryn Thompson, Sarah Jane Waller, Helen Badge, Susan Thompson, Conor Smith, Monique Tovo, Tara Dimopoulos-Bick, Christine Fuller, Nabill Jacob

Background: Anecdotal evidence exists that people who are blind, have low vision or diplopia, experience variation in the care they receive whilst in hospital. Feedback from staff highlighted uncertainty in how this patient cohort is best cared for in relation to their vision impairment, which maybe longstanding or recently acquired. Experience-based co-design (EBCD) is a rigorous evidence-based approach that brings together consumers, families and staff as active partners in healthcare improvement.

Aims:

1. Use EBCD to identify nature of experiences of people who are blind, have low vision or diplopia when they are in hospital and those who care for them.
2. Co-design, test and implement solutions to improve the experience of patients, carers and staff.

Methods: Use of proven EBCD approaches to start-up and engage, gather, understand, improve, measure the impact of various solutions.

Results: A co-design steering group was established including hospital staff, NSW Agency for Clinical Innovation (ACI), consumers or people with lived experience, Vision Australia and Guide Dogs. The EBCD processes were adapted to meet the access needs of people who are blind or with low vision.

Experience mapping described themes related to admission and consent, daily living, orientation to the ward and hospital environment, communication, maintaining independence and preparing for and being discharged from hospital. The themes included emotions and patient safety issues that may not have been identified through other research methods. The benefits of EBCD and results from capability training, co-design and solution testing were presented.

ARTIFICIAL VISION: LEARNING TO INTERPRET PHOSPHENES

Elizabeth Baglin

Vision prostheses, commonly referred to as 'bionic eyes' are implantable medical devices that are designed to provide artificial vision in people with profound vision loss. The devices work by using electrical or light energy to activate cells that are still intact along the visual pathway. They can be placed in a number of positions in the eye or visual cortex depending on the cells being targeted.

Retinitis pigmentosa (RP) is the leading cause of blindness in working-age adults due to degeneration of the photoreceptor layer of the retina. Those with advanced RP might benefit from a bionic eye device called a retinal prosthesis, implanted within the eye. A retinal prosthesis bypasses the degenerate photoreceptor cells to directly stimulate the inner retinal cells. Stimulation of the inner retinal cells can elicit the perception of flashes of light know as phosphenes, forming the basis of artificial vision.

Following a proof of concept study ending in 2014, researchers in Melbourne are currently conducting a trial of a second-generation bionic eye (NCT03406416). Between February and August 2018, four participants with end-stage RP were recruited and unilaterally implanted with a suprachoroidal retinal prosthesis. Following a period of device fitting, all four participants are able to reliably perceive phosphenes. This presentation outlined how the second-generation suprachoroidal device may enhance functional vision in participants with end-stage RP, whilst performing activities of daily living.

A RANDOMISED TRIAL TO INCREASE THE ASSESSMENT ACCURACY OF GLAUCOMA AND OPTIC DISC CHARACTERISTICS BY ORTHOPTISTS

Jane Scheetz, Konstandina Koklanis, Myra McGuinness, Maureen Long, Meg Morris

Introduction: To determine the accuracy of orthoptists when examining the optic disc for signs of glaucoma, and to explore the impact of targeted education on accuracy.

Methods: Participating orthoptists were presented with 42 monoscopic optic disc centred images and asked determine glaucoma likelihood, optic disc size, shape, tilting, vertical cup to disc ratio, cup shape, depth, presence of haemorrhage, peripapillary atrophy (PPA), and retinal nerve fibre layer (RNFL). The level of agreement with specialist ophthalmologists was assessed. Participants were then randomly assigned to an experimental group (targeted post-graduate education on optic disc assessment) or to no intervention. The educational program was designed to increase knowledge of the characteristic features associated with glaucomatous optic neuropathy. All participants re-examined the included optic disc images after a period of 6-8 weeks. The primary outcome measure was a change in agreement between attempts.

Results: The education group showed significant improvements between attempts for identifying haemorrhages ($p=0.013$), RNFL defects (0.035), disc size ($p=0.001$), PPA ($p=0.030$) and glaucoma likelihood ($p=0.023$). The control group did not show any statistically significant improvement. The intervention group showed significantly more improvement when identifying haemorrhages ($p=0.013$), disc size ($p=0.001$), disc shape ($p=0.033$) and cup shape ($p=0.020$) compared to the control group.

Conclusion: Orthoptists who receive additional postgraduate education based on principles of adult learning are more accurate at assessing the optic disc for glaucoma. These results highlight the value of continuing education to optimise clinical practice in allied health professionals.

THE STABLE MONITORING SERVICE FOR GLAUCOMA – WHAT ARE WE DOING WELL AND WHAT CAN WE DO BETTER?

Melanie Lai

In 2018, Sydney Eye Hospital Orthoptic Department commenced a Stable Monitoring Service (SMS) for patients with low risk glaucoma or suspect glaucoma in collaboration with the glaucoma specialist unit. The purpose of the SMS clinic improve is to improve service delivery by ensuring patients receive the right care at the right time, whilst ensuring we maintain delivery of high-quality patient care and improving the overall patient experience.

Glaucoma specialists can refer patients into the SMS clinic and orthoptists perform the comprehensive patient assessments, review results and make recommendations on the review plan. Currently, a glaucoma specialist then reviews the orthoptist's recommendation to determine appropriateness of the recommendation.

The role of the orthoptist in the SMS, inclusion criteria for acceptance into the service, and patient assessment, clinical results that guide the orthoptists' decision making, and agreement between orthoptist and ophthalmologist care recommendations was discussed.

EYE CARE ABOUT ICARE

Julie Lam

Glaucoma within Australia is currently the leading cause of irreversible blindness and is thought to affect up to 300,000 people in Australia of which only half have been diagnosed.

Due to the nature of the disease process, and the variability amongst every individual at which the level of the intraocular pressure incurs damage at the optic nerve, it is imperative for patients to attend regular ophthalmic appointments for intraocular pressure (IOP) monitoring to pre-determine treatment and management plans efficiently (medications/drops, laser, micro invasive glaucoma surgery (MIGS) or surgical glaucoma filtration/drainage intervention). This can essentially at times be logistically difficult and non-economically viable for some.

However, with the introduction of innovative technology such as the iCare Home, we now have the ability to deploy patients in using self-monitoring IOP devices to plot their IOPs anywhere and at any time without the need of attending clinic. We are also placing empowerment back with our patients by providing them with the opportunity to contribute to their treatment plans.

In further expansion, it can also prove to be a useful application in the modern realm of teleophthalmology for people living in rural communities. This case series explored the implementation of iCare Home data on three different patients.

CULTURALLY SAFE ORTHOPTICS - SOME THOUGHTS RELATING TO ABORIGINAL AND TORRES STRAIT ISLANDER EYE CARE

Rosamond Gilden

Cultural safety considers how a health professional does something, not what they do, in order to not engage in unsafe cultural practice that diminishes, demeans or disempowers the cultural identity and wellbeing of an individual. Health practitioners need to adopt an ongoing process of self-reflection and cultural self-awareness and an acknowledgement of how a health practitioners personal culture impacts on care to deliver cultural safe care.

In relation to Aboriginal and Torres Strait Islander health, cultural safety provides a decolonising model of practice based on dialogue, communication, power sharing and negotiation, and the acknowledgment of white privilege. These actions are a means to challenge racism at personal and institutional levels, and to establish trust in health care encounters (from CATSINaM 2017).

Cultural safety is being introduced across Australia in health professional education and practice through government and regulatory guidelines and by professional organisations adopting proactive approaches to reconciliation. This builds on a recommendation of the Roadmap to Close the Gap for Vision, which identifies the need for culturally safe mainstream practices. It is evident that to close the gap for vision for Aboriginal and Torres Strait Islander Australians, health practitioners involved in eye care require appropriate cultural capabilities.

In this presentation, we explored the training and development needed to support orthoptists to provide culturally safe eye care for Aboriginal and Torres Strait Islander Australians.

CATARACT PATIENTS: TELL ME WHAT YOU WANT, WHAT YOU REALLY, REALLY WANT

Vu Quang Do, Tracey Laba, Blake Angell, Anna Palagyi, Peter McCluskey, Andrew White, Nicole Carnt, Fiona Stapleton, Lisa Keay

Background: It has always been hard to know what patients really want and what they value most when deciding where to access their cataract surgery. Patients tend to overrate the importance of service features, and traditional surveys used in the past have considered features in isolation rather than in combination with one another. Both instances lead to an overestimation of value, and altogether makes it difficult for governments and policy makers to determine what aspects of services that are most important to patients.

Aim: To examine what service features have the greatest influence on patient choice regarding access to cataract surgery; and to estimate how much patients are willing to pay for these attributes.

Methods: A discrete choice experiment (DCE) was conducted at two secondary public hospital ophthalmology clinics in Sydney, Australia. A mixed multinomial logit model was used to estimate the relative influence of key features on cataract service preference (odds ratio) and the willingness to pay for improvements in these attributes ($AUD).

Results and Conclusion: Shorter wait times, lower out-of-pocket costs, senior surgeon experience and good institutional reputation were major influences on participant choice for cataract surgery services. Participants were willing to pay for these attributes despite the major influence of cost on service choice. Patient willingness to trade between attributes and to pay for service characteristics opens opportunities to improve upon current models of care and inform future funding policies.

LONG TIME - NO ASCAN

Catherine Mancuso, Suzanna Talevski

From the time of the purchase of our first optical biometer at the Royal Victorian Eye and Ear Hospital (E+E) approximately 17 years ago, we made an assumption - with this new technology being so accurate and repeatable there would be no need to routinely remeasure an axial length for the second cataract surgery, where no other surgical procedure or significant ocular trauma had taken place.

This assumption was built into our protocols for biometry, as with approximately 10,000 cataracts performed each year at E+E there are a significant number of biometry measurements to perform.

Seventeen years on, without any significant adverse events relating to our assumption and in the absence of any literature around to suggest a change in our process, the Orthoptic Department has been asked to change our protocol to repeat the biometry for the second eye surgery if a previous measurement was performed more than two years earlier.

An audit of the results and the variations in the measurements was presented and the implications discussed.

TRIFOCAL INTRAOCULAR LENS (PANOPTIX IOL) USE IN PATIENTS WITH PRIOR CORNEAL REFRACTIVE SURGERY

Kate Roberts

Purpose: Although laser refractive surgery has proven safe and effective, corneal ablations may impact visual quality. For post-laser refractive patients proceeding to cataract surgery, difficulties in obtaining accurate post-surgical refractive outcomes are well documented. Trifocal IOLs offer independence at all distances, however patient selection is key to maximising both outcomes and patient satisfaction. Previously post-refractive patients were considered sub-optimal for trifocal implantation however improvements in laser technology and our understanding of IOL power calculations now suggests this may be a reasonable option for selected, motivated patients. This study aims to investigate IOL calculations following prior laser refractive surgery.

Methods: This represents a retrospective review of consecutive patients with a history of prior laser refractive surgery who have undergone bilateral implantation of the Panoptix IOL. Refractive and visual outcomes are reported.

Results: 20 eyes were included in the analysis (14 previously myopic). Seven eyes required toric IOL implantation. The mean axial length was 23.86 ± 1.43mm and mean average keratometry 42.49 ± 2.99D. The mean arithmetic difference from target was -0.13 ± 0.39D and mean absolute difference from target was 0.24 ± 0.33D. 87.5% of eyes achieved UDVA of 6/6 or better, UIVA of N8 or better and UNVA of N5 or better. Five of 19 eyes underwent YAG capsulotomy following surgery.

Conclusion: Refractive and visual outcomes in this cohort are equivalent to results achieved in routine cases. Patient satisfaction was high, suggesting that trifocal IOL implantation can be a successful option for selected patients with a history of prior refractive surgery.

SUNLIGHT AND MYOPIA, HOW MUCH IS REALLY ENOUGH?

Long Phan, Amanda French, Ian Morgan, Kathryn Rose

Purpose: To compare objective light exposure measures in young Australian adults to the required levels in experimental environments for myopic protection.

Methods: 102 university students wore a light data logger over four days (2 week and 2 weekend days) in autumn, 2014. Participants simultaneously completed a 24-hour diary to capture indoor and outdoor exposures and activities undertaken.

Results: Subjects spent approximately 11.3% of daylight hours outdoors, equating to ≈81 minutes of exposure to lux >1,000 on a day with 12 light-hours. Of this, only ≈18 minutes was spent in environments >10,000 lx and a further ≈6 minutes >40,000 lx. The main activity differentiating behaviour on weekdays vs weekend days was tertiary education. However, this made no significant difference to the time spent in all light intensity ranges (0-100,000+ lx) nor in the mean daily light level experienced. Yet there was a graphic difference in the daily pattern of light exposure with weekday patterns more sporadic from sunrise to sunset.

Conclusion: Very little time was spent at light levels deemed protective in animal studies that used continual myopic stimuli, potentially leading to an overestimation of the requirements for protection in humans. Recent epidemiological evidence from Taiwan suggests that lower light exposures in humans may be protective for myopia. Spending time in education causes total light exposure to accumulate over multiple short intervals. Given that phasic dopamine release can occur from intermittent exposure to high intensity light, protective effects may continue if exposure times and intensities are kept above threshold.

INVESTIGATING THE EFFECT OF CHILDHOOD AND ADOLESCENT TIME SPENT OUTDOORS ON RISK OF MYOPIA IN YOUNG ADULTHOOD USING AN OBJECTIVE MARKER

Gareth Lingham, Kun Zhu, David Mackey, Robyn Lucas, Wendy Oddy, Patrick Holt, Lucinda Black, John Walsh, Seyhan Yazar

Purpose: To investigate whether serum 25-hydroxyvitamin D [25(OH)D] concentrations, a marker of vitamin D and recent time spent outdoors, at ages 6, 14, 17 and 20 years are associated with risk of myopia at age 20 years.

Methods: Participants of the Western Australian Pregnancy Cohort (Raine) Study had cycloplegic autorefraction at the 20-year follow-up and had serum 25(OH)D concentrations measured at the 6-, 14-, 17- and 20-year follow-ups. Myopia was defined as spherical equivalent ≤-0.50D. Serum 25(OH)D concentrations were de-seasonalised. Linear mixed models were used to calculate the average yearly change in 25(OH)D concentration for each subject. Logistic regression models were used to analyse the associations between myopia and 25(OH)D.

Results: Autorefraction data were available for 1,317 individuals and 282 (22%) were myopic. Average yearly change in 25(OH)D was -0.90 nmol/L (range -2.12 to 1.14). After adjusting for sex, Caucasian race, parental myopia, body mass index and studying status, low 25(OH)D at 20-years, but not at age 6, 14, or 17 years, was associated with higher odds of myopia at age 20 years (per 10nmol/L decrease, OR[20-years]=1.10, 95%CI 1.02, 1.18). A more negative yearly change (ie faster decline) in 25(OH)D with increasing age was associated with higher odds of myopia (per 1 nmol/L/year decrease OR=1.69, 95%CI 1.12, 2.56).

Conclusions: Myopia at age 20 years was associated with decreasing and recent, but not past, 25(OH)D levels. Using an objective marker, we were unable to demonstrate that more time outdoors during childhood or adolescence decreased long-term risk of myopia.

MODERN APPROACHES TO MYOPIA CONTROL: A CASE STUDY ON THE USE OF ATROPINE IN A CHILD WITH PROGRESSING MYOPIA

Georgia Alberti

An investigative case report concerning a young female who presented with bilateral high myopia and astigmatism with rapidly increasing refractive error. Atropine 0.01% drops were prescribed in attempt to slow or stop the rapid progression of short sightedness.

As mentioned by Lions Eye Institute paediatric ophthalmologist Antony Clark (2018), 'It is predicted that by 2050, Myopia will be the world's leading cause of blindness'. With this alarming prediction in mind, it becomes clear why further investigations are required to provide eye specialists, such as orthoptists, with the insight and knowledge into the modern approaches to both myopia identification and control when it is at a point of rapid rise. Highlighting the importance and purpose of this case report.

In conjunction with the use of corrective lenses, other management options which may be considered include atropine eye drops and increased sunlight exposure. Atropine in the Treatment of Myopia (ATOM I and II) studies conducted in Singapore show effectiveness of both options for Asian children. Currently, a similar trial is occurring in Australia to attempt similar results.

The purpose of this case presentation is to explore the modern approaches to control myopia in children and their efficiency across varying environments and cultures, through examining different literature. All relevant clinical investigations performed are detailed with particular focus on visual acuity results and refractive power values, as she was monitored throughout the two years while using atropine. All related ocular variables and findings were discussed in comparison to the relevant and current literature.

ANISEIKONIA, ANISOMETROPIA AND AMBLYOPIA

Jay South, Joanna Black, Andrew Collins, Tina Gao, Jason Turuwhenua

Aniseikonia is a perceived difference of image size or shape between the two eyes and can arise from physiological, neurological, retinal, and optical causes. Aniseikonia is associated with anisometropia, as both anisometropia itself and the optical correction for anisometropia can cause aniseikonia. Image size differences of three percent or more can impair binocularity in otherwise visually normal adults. Above this level of aniseikonia, binocular inhibition or suppression tends to occur to prevent diplopia and confusion.

Aniseikonia can be measured using a range of techniques or estimated from biometry, however subjective testing is the only way to accurately measure the overall perceived amount of aniseikonia. Despite clinically available tests, currently, aniseikonia is not routinely assessed in most clinical settings. As at least two-thirds of patients with amblyopia have anisometropia, we may expect aniseikonia to be common in patients with anisometropic amblyopia. However, aniseikonia may not be experienced under normal binocular viewing conditions if the image from the amblyopic eye is of poor quality or is too strongly suppressed for image size differences to be recognised.

Contact lenses or specially designed spectacle lenses can be used to correct or reduce aniseikonia. Current guidelines for the treatment of amblyopia advocate full correction of anisometropia to equalise image clarity but do not address aniseikonia. Signicant image size differences between eyes may lead to suppression and abnormal binocular adaptations. It is possible that correcting anisometropia and aniseikonia simultaneously would reduce the development of suppression and improve treatment outcomes for anisometropic amblyopia.

SWEPT SOURCE OCT ANGIOGRAPHY (SS-OCTA) - CLINICAL APPLICATIONS IN AMD; INTRODUCING THE SIRE SIGN

Emily Caruso, Callum Narita, Zhichao Wu, Robyn Guymer

Swept Source Optical Coherence Tomography – Angiography (SS OCT-A) allows imaging of the blood vessel network without the need for contrast such as fluorescence. In AMD this has enabled us to learn about the blood vessels within the retina in different stages of AMD other than just exudative macular neovascularisation (MNV). SSOCT-A has also allowed for detection of asymptomatic, non-exudative macular neovascularisation (NE-MNV), which is considered a risk factor for exudative MNV.

Participants with known NE-MNV identified by SS-OCTA were used to identify features on structural spectral domain OCT (SD-OCT) imaging, characteristic of NE-MNV. The common structural changes that were seen in these patients define the SIRE Sign - shallow, irregular retinal pigment epithelium (RPE) elevation. The features are; an RPE elevation with an irregular RPE contour, a greatest transverse linear dimension of at least 1000μm, a height above Bruch's membrane of predominantly less than 100μm, and a non-homogenous internal reflectivity. These features were then used to perform masked grading of SD-OCT structural images from 233 eyes of 132 AMD participants with large drusen to see if these structural signs predict NE-MNV.

SIRE can be used as a screening tool on routine structural OCT imaging, with OCTA imaging providing a definitive diagnosis of NE-MNV. If NE-MNV is diagnosed, more frequent follow-up and diligent home monitoring are recommended for early detection of exudation.

FUNDUS AUTOFLUORESCENCE PATTERNS IN BEST'S VITELLIFORM MACULAR DYSTROPHY

Thomas Groeneveld, Shanil Dhanji, Hira Sau, Maria Korsakova, Nonna Saakova, Haipha Ali, Clare Fraser, Robyn Jamieson, John Grigg, Nina Mustafic

Introduction: Limited studies have examined fundus autofluorescence (FAF) patterns in the different stages of Best's disease. We set out to further perform an analysis of our FAF images obtained on patients with a diagnosis of Best's disease and investigate the correlation between the FAF patterns and disease stages.

Methods: FAF images, best corrected visual acuity (BCVA), EOG Arden ratio, and Full Field ERG were examined in 28 eyes (14 patients) with confirmed Best's disease diagnosis between 2009 and 2017. FAF patterns were determined based on previous literature and compared to the disease stage.

Results: FAF patterns found amongst our cohort included: hyperfluorescent, hypofluorescent, patchy, ring, and normal. Normal FAF pattern was seen in only 33% of pre-vitelliform (n=2). Hypofluorescence was only found in atrophic macular lesions (n=2).

Discussion and Conclusion: FAF patterns were only useful for identifying the early or late stages of Best's disease, with the other disease stages having no stage-specific FAF pattern Previous literature findings suggested vitelliform and vitelliruptive stages can have a hyperfluorescent, ring or patchy FAF pattern. Hyperfluorescence was associated with better visual acuity levels. In conclusion FAF images can be useful in identifying previtelliform or atrophic stages of the disease and can be used in estimating anticipated acuity level through FAF pattern analysis.

TATTOO-ASSOCIATED UVEITIS

Debra Gleeson

As a cosmetic and decorative body art, tattooing has dramatically increased particularly among young adults. A survey of 1,013 Australians by market researcher McCrindle in 2018 showed that the number of people getting tattooed had hit a record high with one in five people having one or more tattoos. The majority (61%) had more than one tattoo and around 14% had six or more. Fifty-one percent had obtained their first tattoo between the ages of 18 and 25, and 36% at 26 or older. Australian women with tattoos (20%) outnumber men (19%).

We need to be aware of a possible increase in presentations of tattoo-associated uveitis.

'LET'S LOOK AT SQUINT AFRESH' - WHEN TACKLING IT ONLY ONCE IN A BLUE MOON

Angela Chung, Terence Tan

This presentation looks at squint assessments during ophthalmic based clinics such as corneal, glaucoma, retinal and refractive clinics. It presented a refresher for those who may not regularly be exposed to patients requiring a squint assessment as their presenting reason.

It aimed to discuss the importance of mindset, tips for a happy outcome of squint examination, essential measurements, time constraints, relying on ingrained knowledge and common examples that we may come across.

THE HUMPHREY VISUAL FIELD; WHERE WE WERE AND WHERE WE ARE NOW

Carly Hicking

Glaucoma, one of the leading causes of vision loss in Australia, is a disease when caught early, progression may be slowed. Visual field testing is a major component of detection and monitoring of glaucoma progression.

Glaucoma progression is regularly monitored using the Zeiss Humphrey Visual Field (HVF). Zeiss is working closely with clinics in order to improve the reliability and ease of use of their equipment.

Specific tests can be used to detect changes in a patient's visual field. The primary tests performed on HVF in a glaucoma clinic examine the peripheral visual field. When a central defect is identified, a central test is performed to assess the nature of this defect. When early changes to the central field occur, treatment can be personalised for each patient to limit the progression of the disease prior to it affecting their quality of life.

Orthoptists must monitor testing to ensure correct usage of equipment and that the test is performed to the highest of standards. If performed incorrectly, results may not be usable or may lead to a false diagnosis. The Asia Pacific Glaucoma Guidelines has an appendix which may be followed.

Orthoptists must realise the impact of the tests they perform, question why each test is being performed and whether it will aid identification of early changes in a visual field and thus affect the treatment of glaucoma.

LOW VISION: OLD SKILLS IN THE NEW ERA

Vincent Nguyen, Second year orthoptic students

Effectiveness of taking an ocular history remains a strength of a practising orthoptist. However, the contents of ocular history taking may be slightly different in a low vision setting. To gain knowledge about the impact of vision loss and to appreciate how it affects individuals, second year UTS orthoptic students were required to interview people with recognised low vision. The student's aim was to consider how loss of sight or absence of sight could affect each individual interviewed. Students formulated their own quality-of-life questionnaires prior to interviewing and were required to consider the following areas: daily living, employment, education, social network, and psychological effect. The interview occurred either at the interviewee's workplace or a public place such as a public library. Interviews were conducted in groups of three so students could assist one another with the reflective interview process. The data collected were reported and the effect of sight loss on individual was discussed with the focus on the functional loss.

DISCUSSING LOW VISION AND BLINDNESS WITH YOUR PATIENTS - POST CLINICAL SERVICES

Nabill Jacob

When is the right time to start referring patients to vision loss support services? Should this wait until the end of medical treatment? Life-changing support is available from diagnosis, but when is the right time to refer? And who is responsible for referring - the ophthalmologist, orthoptist, optometrist or GP, or should the patient self-refer? This interactive session looked at the continuum of care for vision loss; who should refer, triggers for referral, how to refer, and patient case studies.

The range of support and services available to patients of all ages experiencing vision loss were discussed. Many may surprise, including how advances in technology are dramatically improving the lives of people living with vision loss. It is important that ophthalmologists understand the support and services available so they can better inform and refer their patients. Vision Australia is the leading national provider of blindness and low vision services supporting people to live the life they choose.

A MULTIDISCIPLINARY APPROACH TO SERVICE DELIVERY: COLLABORATION BETWEEN SOCIAL WORK AND ORTHOPTIST IN LOW VISION PATIENT CARE

Afsah Zaheer

Low vision is known to reduce patients' quality of life, often more severely than other common chronic conditions (QALY -74.93 years). Approximately 8.2% of Australians live with low vision, with this percentage increasing over time. Centrelink indicates only 18,000 elderly Australians receive disability support/age pension and 40,000 who satisfy the criteria, do not. A possible way to decrease this number is to provide patients with a connection that enhances patient awareness and access to services in early stages of disability.

Our centre receives visits by low vision patients on a daily basis. A more holistic approach is achieved through the Patient Care Coordinator (PCC) role. The PCC (a social worker), is a link between the patient and their family/carers, the clinicians and various support agencies to assist low vision patients in navigating support services. For the PCC to effectively assess the impact of the patient's condition on their daily life and find appropriate support, the orthoptist provides context about their current ocular status and prognosis (eg implications of a constricted VF). In clinic, the PCC works closely with orthoptists and ophthalmologists, providing counselling and emotional support to the patients at the time of their review.

From our experience of adapting the biopsychosocial model, we conclude that the future approach to low vision patients in a busy ophthalmic clinic would benefit from such model of service as well as increasing functional vision assessments of patients. Greater collaboration between social workers and orthoptists could lead towards establishing more effective pathways.

WHAT IS THE ROLE OF THE ORTHOPTIST AND OPHTHALMOLOGIST IN THE NDIS APPLICATION PROCESS?

Alison Byrne

The rollout of the National Disability Insurance Scheme (NDIS) has significantly changed the way disability services providers operate. The NDIS is a social welfare scheme of the Australian Government and provides support to eligible people with a disability. The NDIS replaced a system of disability care where the government provided block funding to disability service providers. Through the NDIS, funding is now allocated to the individual who has choice and control over the provider who will supply goods and services. This has resulted in service providers now having to access NDIS funds through individual clients.

People with vision impairment are currently required to be enrolled in the NDIS to access vision services, as many vision service providers are required to charge for their services to be sustainable. In some cases, the NDIS can be difficult to negotiate and the application process can often delay their access to the early intervention, therapy, equipment and support that they require.

This presentation discussed the NDIS eligibility criteria for people with vision impairment, the importance of an early NDIS application especially for young children accessing early intervention services, how orthoptists and ophthalmologist can assist clients with their NDIS application process and what information is required in an ophthalmology report that is being used for an NDIS application.

NDIS has significantly transformed the way vision service providers operate. This presentation will discuss the important role orthoptists and ophthalmologists have in supporting the NDIS application process for their clients who have vision impairment.

A NEW OCULAR GENETIC CLINIC AT THE ROYAL VICTORIAN EYE AND EAR HOSPITAL

Lisa Kearns, Thomas Edwards, Alex Hewitt, Marc Sarossy, Mark McCombe, Mark Petty, Tracy Siggins, Catherine Mancuso, Aamira Huq, Joshua Schultz, Paul James, Ingrid Winship, Jonathan Ruddle

Inherited eye diseases are a significant cause of blindness. They impact on the reproductive decision making of affected individuals, parents of affected children and other family members. Historically, there have been no effective treatment options. With increased understanding of the genetic basis of these conditions, genetic testing becoming more affordable and promising gene and stem cell therapies entering clinical trial, resources are urgently required to manage patients with inherited eye disease.

The new Ocular Genetics Clinic (OGC) at the Royal Victorian Eye and Ear Hospital (RVEEH is a partnership between the RVEEH and Royal Melbourne Hospital (RMH) with patients being reviewed by a specialised multi-disciplinary team integrating ophthalmology, orthoptics, medical genetics and genetic counselling.

This specialised service assesses patients with inherited retinal diseases, inherited optic neuropathies, anterior segment dysgenesis and systemic genetic diseases with associated ocular involvement. Patients complete their vision and electrodiagnostic testing in the well-established Ocular Diagnostic Clinic (ODC) within the RVEEH, before review in the OGC for additional ophthalmic testing, genetic counselling and, where appropriate, genetic testing. Once confirmed, a genetic diagnosis can lead to a better understanding of the likely natural history, informed decision making in family planning and eligibility for enrolment in research and clinical trials. Since December2018, the clinic has seen 89 patients and undertaken 36 genetic tests.

The Ocular Genetics Clinic is a comprehensive clinical genetic service for patients and families. It is the foundation for genetic eye research and identification clinical trial-ready cohorts for upcoming therapies.

THE EPIC VISION STUDY: ECONOMIC AND PSYCHOSOCIAL IMPACTS OF CARING IN VISION IMPAIRMENT

Diana Jelovic, Deborah Schofield, Melanie Zeppel, Sarah West, Rupendra Shrestha, John Grigg, Robyn Jamieson

Genetic retinal diseases affect approximately 1:3000 people, causing progressive visual impairment. These conditions are genetically heterogeneous, previously a barrier to diagnosis. Genomic testing leads to genetic diagnosis in approximately 65% of patients. In combination with gene editing and replacement approaches, this heralds a new era of diagnostics and therapeutics for these conditions. This project, Economic and Psychosocial Impacts of Caring for Families affected by Visual Impairment (EPIC Vision), is being undertaken to facilitate implementation into the healthcare system and is the first project in Australia to systematically investigate costs of care at different ages and stages of the genetic retinal disease process.

Face-to-face interviews examine the economic impact of visual impairment and genetic diagnosis on individuals and families, and investigate psychosocial impact on affected adults and children, primary carers and partners. Patients are recruited from The Children's Hospital at Westmead, Westmead Hospital, Sydney Eye Hospital and Save Sight Institute, where individuals and multigenerational families with inherited retinal diseases are seen for ophthalmic and genetic assessments and review, at all stages of life and the diagnostic journey. The questionnaires capture quality of life, visual functioning and social and economic impacts. Data linkage approaches will assess these costs in concert with government costs.

Information pertaining to health costs at different life stages will build a longitudinal model of health and welfare costs, to develop a full understanding of the lifetime economic and psychosocial impact of genetic retinal diseases on the individual and society, and the value of genomic diagnostic and therapeutic approaches.

OPHTHALMIC MANIFESTATIONS AND SENSORY IMPAIRMENTS IN STICKLER SYNDROME

Georgia Shaw

Stickler syndrome is a group of hereditary connective tissue disorders. Stickler syndrome can be inherited in an autosomal dominant or autosomal recessive manner. It is characterised by a unique facial appearance and is associated with high myopia, glaucoma, cataracts and retinal detachment. Hearing loss of varying degree is also a well-known feature. Cases of Stickler Syndrome that are seen at The Children's Hospital at Westmead were discussed.

OSTEOPETROSIS AND THE VISUAL SYSTEM

Katie Geering

Osteopetrosis is a rare disease that refers to a group of inherited skeletal disorders, causing an increase in bone density. It can be inherited in various ways, autosomal dominant (most common), as well as autosomal recessive and X-linked recessive. Osteopetrosis varies in severity and age of onset, and as a result the characteristics vary between patients. Osteopetrosis is often known to involve the optic canal, causing irreversible optic neuropathy and blindness. This aspect of osteopetrosis will be discussed as well as the impact current treatment modalities have on halting the progression of this disease.

A COMPARISON OF THE HOTV LOGMAR VERSUS SHERIDAN GARDINER CHART FOR PRESCHOOL VISION SCREENING: THE STATEWIDE EYESIGHT PRESCHOOLER SCREENING (STEPS) PROGRAM

Mythili Ilango, Amanda French, Kathryn Rose

Introduction: The StEPS Program has transitioned from the Sheridan Gardiner (SG) to the HOTV LogMAR chart (HOTV). We aim to determine the comparability of these two visual acuity (VA) charts.

Method: Children aged 4 (n=67) were recruited through the StEPS program and had vision screened at their preschool, using SG and HOTV, and an orthoptic assessment. Children with poor vision were classified as routine (VA ≤6/9-2) or high priority (VA ≤6/18) referrals.

Results: Of the 64 children tested, VA using HOTV identified four who qualified for routine referrals and no high priority referrals. SG testing found 18 routine and one high priority referral, representing an additional 23.4% of children who would be referred using SG alone. The difference in mean VA between HOTV (logMAR: 0.11) and SG (logMAR: 0.17) was significant (3 letters, $p<.001$). Four children had an inter-ocular difference (IOD) of at least two VA lines using SG. For two children, the IOD disappeared upon testing with HOTV. One child was a routine referral on HOTV, however, the other child was classified a pass using both tests. Two children (3%) were referred on orthoptic assessment alone (end point nystagmus and anisocoria).

Conclusion: Referral differences related to the chart used is likely due to the greater testability of HOTV. VA cut-off 6/9-2 remains suitable for routine referrals using HOTV. As an IOD of two lines is considered clinically significant, it could be included in the referral criteria. Orthoptic assessment did not have a large enough effect to recommend for screening protocols.

DOES VISION SCREENING PLAY A ROLE IN IDENTIFICATION OF DUAL SENSORY IMPAIRMENT?

Rachel Elliott

A review of the literature shows a consistently higher prevalence of visual problems and ocular abnormalities in deaf children than in their peers with normal hearing. Infants who do not pass the statewide infant screening – hearing (SWISH) program are frequently referred for an ophthalmic review. In many cases the initial vision assessment in these newborns is normal. However, it is important as health professionals that we remind these families to have their child's vision reviewed periodically throughout childhood and adolescence as we know there are many visual problems that develop over time and which are not apparent in the newborn.

Usher syndrome is one such example. Usher's is a genetic condition that involves hearing loss and the development of retinitis pigmentosa. The hearing loss is evident at birth or very early childhood, however the diagnosis of retinitis pigmentosa is usually made later in childhood or in adolescence.

Two cases were described of students enrolled in RIDBC schools for deaf and hearing-impaired students. Both students failed a routine primary school vision screening with mildly reduced distance vision loss and questionable visual fields. Subsequent review and further investigation with an ophthalmologist resulted in a diagnosis of Usher syndrome for both students.

Vision screening for children who are deaf or have a severe to profound hearing impairment should occur regularly throughout their primary and secondary school years to avoid losing valuable time implementing new teaching strategies and equipment should a vision issue be identified.

THE USE OF FRESNEL PRISMS IN CLINICAL PRACTICE

Yi Ling Tan

Introduction: Fresnel prisms are typically used for diplopia relief and prism adaptation prior to strabismus surgery. Although Fresnel prisms relieve patients of diplopia, the prisms may affect the patient's vision and cause optical aberrations. The purpose of the clinical audit was to evaluate the reasons for which Fresnel prisms were prescribed, and the frequency of Fresnel prism changes.

Methods: A retrospective audit of patients prescribed with a new Fresnel prism from October to December 2017. One-year follow-up data was extracted to find out the diagnoses of the patients, the mean prism power given, and the changes in Fresnel prisms over time.

Results: 116 patients were prescribed Fresnel prisms, 80 males and 36 females, with a mean age of 59.8 years (± 17.35 SD). The most common diagnoses were decompensated esotropia (24, 19.2%), sixth nerve palsy (24, 19.2%) and fourth nerve palsy (22, 17.6%). Fresnel prisms of ≤ 10PD were most commonly prescribed (84, 68.3%). Of the 91 patients who returned for follow-up, 32 (35.2%) had no changes to Fresnel prism strength. Fifteen patients (16.5%) no longer needed Fresnel prisms as their diplopia resolved. Only seven patients (7.7%) stopped using Fresnel prisms due to reduced vision, torsional diplopia and/or optical aberration.

Discussion: Fresnel prisms were generally well tolerated and are useful in diplopia relief. In this audit, prism power was likely to remain unchanged, especially for decompensated and restrictive strabismus. Prisms for neurological strabismus would mostly reduce or even resolve over time.

PRISMS: AN EYE CLINICIAN'S PERSPECTIVE FOR ATAXIA AND GAIT/BALANCE DISORDERS

Cem Oztan

Ataxia is defined as the presence of abnormal, uncoordinated movements, which can make walking and maintaining balance difficult. There are four neurological divisions to maintaining balance: the vestibular system; the visual system; brain (frontal lobes, basal ganglia and cerebellum); and peripheral nerves, muscles and spinal cord. The clinician is faced with the unique challenge of examining, translating clinical results to the reported symptoms and providing therapy to patients presenting with ataxia, gait and balance disorders. The aim of this presentation was, through the use of two paediatric patient cases, to briefly review the anatomy of the vestibular system and cerebellum, highlight novel vision testing techniques, and provide an extended insight into the optics properties of prism lenses and their use as a therapy option for patients presenting with ataxia, gait and balance disorders.

CHANGE IN REFRACTION FROM THE USE OF UPPER EYELID WEIGHTS IN A PATIENT WITH BILATERAL VI AND VII CN PALSIES

Liane Wilcox

A long-term patient recently presented with reduced vision following facial reconstruction surgery which involved the placement of lid weights to aid in upper eyelid closure. The patient had previously developed bilateral VI and VII cranial nerve palsies following a traumatic brain injury in 2013. The patient's complex history was presented, outlining the various ophthalmic/orthoptic/surgical treatments undergone by this patient to highlight the outcomes possible from such a devastating injury. Emphasis was placed on the mechanism behind the effect of the most recent surgical procedure of the upper eyelid weights and the subsequent unexpected significant change in her refraction.

TORSION

Linden Chen, Elizabeth Sung Ju Baek, Ross Fitzsimons

Ocular torsion, as von Noorden put it, has always been put on the back-burner of strabismus. It is a phenomenon that we often accept exists, but almost never seems to be dealt with in too much detail. Our presentation firstly used a case to break down torsion into two separate entities: objective and subjective torsion. The purpose of our research was then to find any correlation between the two entities. Our hypothesis was that there was no correlation between the two. We used the Heidelberg OCT to measure objective torsion and the Torsionometer to measure subjective torsion.

WHY WON'T THE EYE GO UPWARDS? A CASE OF MONOCULAR ELEVATION DEFICIT

Coco Howard

Monocular elevation deficit, or double elevator palsy, is a condition defined by congenital deficiency of monocular elevation with associated hypotropia and ptosis/pseudoptosis. A retrospective review has been conducted on patients with monocular elevation deficit at The Sydney Children's Hospital Westmead and Randwick sites. The presenting reason, patient's age, visual outcome and treatment type was discussed.

A THIRD?

Nia Stonex

A second opinion was requested for a 56 year-old male who had a previous history of an intracranial posterior fossa astrocytoma treated with radiotherapy when 21 years of age. Over the past 3 years he started to experience difficulty crossing roads, walking into lampposts and noticed his right eye would turn in at the same time.

Ophthalmological examination showed bilateral optic atrophy and visual field constrictions. Orthoptic evaluation showed signs of a previous IIIrd nerve palsy with aberrant regeneration. Oddly, when trying to adduct the right eye he would develop an esotropia.

A review of publications showed this could be ocular neuromyotonia and treatment with a membrane stabilising agent (carbamazepine) could be effective in resolving/reducing symptoms. The patient was started on oral carbamazepine and his symptoms resolved.

Named Lectures, Prizes and Awards of Orthoptics Australia

THE PATRICIA LANCE LECTURE

1988	Elaine Cornell	Home exercises in orthoptic treatment
1989	Alison Pitt	Accommodation deficits in a group of young offenders
1990	Anne Fitzgerald	Five years of tinted lenses for reading disability
1992	Carolyn Calcutt	Untreated early onset esotropia in the visual adult
1993	Judy Seaber	The next fifty years in orthoptics and ocular motility
1995	David Mackey	The Glaucoma Inheritance Study in Tasmania (GIST)
1997	Robin Wilkinson	Heredity and strabismus
1998	Pierre Elmurr	The visual system and sports perfomance
1999	Kerry Fitzmaurice	Research: A journey of innovation or rediscovery?
2005	Kathryn Rose	The Sydney Myopia Study: Implications for evidence based practice and public health
2006	Frank Martin	Reading difficulties in children - evidence base in relation to aetiology and management
2008	Stephen Vale	A vision for orthoptics: An outsider's perspective
2009	Michael Coote	An eye on the future
2010	John Crompton	The pupil: More than the aperture of the iris diaphragm
2011	Neryla Jolly	On being an orthoptist
2012	Shayne Brown	A snapshot of orthoptics from the 1960s to 2000
2013	Sue Silveira	Finding the leader within
2014	Patricia Dunlop	A life in orthoptics
2015	Fiona Rowe	The spectrum of post-stroke visual impairment
2016	Linda Santamaria	50 years: The development of research and publication in the Australian Orthoptic Journal
2017	Sandra Staffieri	Delayed diagnosis of childhood strabismus: When does it matter?
2018	Marion Rivers	Association and profession - you can't have one without the other
2019	Myra McGuiness	How do we know what we know, and who knows that we know it? Evidence based orthoptic practice

THE EMMIE RUSSELL PRIZE

1957	Margaret Kirkland	Aspects of vertical deviation
1959	Marion Carroll	Monocular stimulation in the treatment of amblyopia exanopsia
1960	Ann Macfarlane	A study of patients at the Children's Hospital
1961	Ann Macfarlane	A case history "V" Syndrome
1962	Adrienne Rona	A survey of patients at the Far West Children's Health Scheme, Manly
1963	Madeleine McNess	Case history: Right convergent strabismus
1965	Margaret Doyle	Diagnostic pleoptic methods and problems encountered
1966	Gwen Wood	Miotics in practice
1967	Sandra Hudson Shaw	Orthoptics in Genoa
1968	Leslie Stock	Divergent squints with abnormal retinal correspondence
1969	Sandra Kelly	The prognosis in the treatment of eccentric fixation
1970	Barbara Denison	A summary of pleoptic treatment and results
1971	Elaine Cornell	Paradoxical innervation
1972	Neryla Jolly	Reading difficulties
1973	Shayne Brown	Uses of fresnel prisms
1974	Francis Merrick	The use of concave lenses in the management of intermittent divergent squint
1975	Vicki Elliott	Orthoptics and cerebral palsy
1976	Shayne Brown	The challenge of the present
1977	Melinda Binovec	Orthoptic management of the cerebral palsied child
1978	Anne Pettigrew	
1979	Susan Cort	Nystagmus blocking syndrome
1980	Sandra Tait	Foveal abnormalities in ametropic amblyopia
1981	Anne Fitzgerald	Assessment of visual field anomalies using the visually evoked response
1982	Anne Fitzgerald	Evidence of abnormal optic nerve fibre projection in patients with dissociated vertical deviation: A preliminary report
1983	Cathie Searle	Acquired Brown's syndrome: A case report
	Susan Horne	Acquired Brown's syndrome: A case report
1984	Helen Goodacre	Minus overcorrection: Conservative treatment of intermittent exotropia in the young child
1985	Cathie Searle	The newborn follow up clinic: A preliminary report of ocular anomalies
1988	Katrina Bourne	Current concepts in restrictive eye movements: Duane's retraction syndrome and Brown's syndrome
1989	Lee Adams	An update in genetics for the orthoptist: A brief review of gene mapping

1990	Michelle Gallaher	Dynamic visual acuity versus static visual acuity: Compensatory effect of the VOR
1991	Robert Sparkes	Retinal photographic grading: The orthoptic picture
1992	Rosa Cingiloglu	Visual agnosia: An update on disorders of visual recognition
1993	Zoran Georgievski	The effects of central and peripheral binocular visual field masking on fusional disparity vergence
1994	Rebecca Duyshart	Visual acuity: Area of retinal stimulation
1995-7	Not awarded	
1998	Nathan Clunas	Quantitative analysis of the inner nuclear layer in the retina of the common marmoset callithrix jacchus
1999	Anthony Sullivan	The effects of age on saccades made to visual, auditory and tactile stimuli
2001	Monica Wright	The complicated diagnosis of cortical vision impairment in children with multiple disabilities
2005	Lisa Jones	Eye movement control during the visual scanning of objects
2006	Josie Leone	The prognostic value of the cyclo-swap test in the treatment of amblyopia using atropine
2007	Thong Le	What is the difference between the different types of divergence excess intermittent exotropia?
2008	Amanda French	Does the wearing of glasses affect the pattern of activities of children with hyperopic refractive errors?
2009	Amanda French	Wide variation in the prevalence of myopia in schools across Sydney: The Sydney Myopia Study
2010	Alannah Price	Vertical interline spacing and word recognition using the peripheral retina
2011	Amanda French	Comparison of the distribution of refraction and ocular biometry in European Caucasian children living in Northern Ireland and Sydney
2012	Melanie Cortes	Treatment outcomes of children with vision impairment detected through the StEPS program
2013	Jess Boyle	The accuracy of orthoptists in interpreting macular OCT images
2014	Allanah Crameri	Orthoptist-led clinics: investigating the effectiveness and efficiency of orthoptists in diabetic retinopathy screening and cataract assessment
2015	Jess Boyle	The psychological impact of repeated intravitreal injections on patients with neovascular age-related macular degeneration
2016	Gareth Lingham	Early life risk factors of amblyopia, strabismus and anisometropia in a young adult population
2017	Linden Chen	The twilight zone
2018	Premkumar Gunasekaran	'Crouch, touch, pause, engage': using a visual tool to detect concussion in rugby union
2019	Shanelle Sorbello	Post stroke vision care in NSW. What are the core pathways and are they working?

PAEDIATRIC ORTHOPTIC AWARD

1999	Valerie Tosswill	Vision impairment in children
2000	Melinda Syminiuk	Microtropia – a challenge to conventional treatment strategies
2001	Monica Wright	The complicated diagnosis of cortical vision impairment in children with multiple disabilities
2005	Kate Brassington	Amblyopia and reading difficulties
2006	Lindley Leonard	Intermittent exotropia in children and the role of non-surgical therapies
2007	Jody Leone	Prevalence of heterophoria in Australian school children
2008	Jody Leone	Can visual acuity screen for clinically significant refractive errors in teenagers?
2009	Jody Leone	Visual acuity testability with the electronic visual acuity-tester compared with LogMAR in Australian pre-school children
2010	Fiona Gorski	Neurofibromatosis and associated ocular manifestations
2011	Suzy King	Understanding Sturge-Weber syndrome and the related ocular complications
2012	Jane Scheetz	Accuracy of orthoptists in the diagnosis and management of triaged paediatric patients
2013	Louise Brennan	Visual outcomes of children seen in the StEPS High Priority Clinic at The Children's Hospital at Westmead
2014	Nicole Carter	Understanding ocular motor apraxia
2015	Lindley Leonard	Long-term follow-up of a high priority referral clinic at The Children's Hospital at Westmead – beyond the clinic
2016	Cem Oztan	A novel method for measuring nystgamus
2017	Sarah Harkins	An audit of paediatric referrals of patients with suspected papilloedema made to The Children's Hospital at Westmead
2018	Renee Hernandez	Retinopathy of prematurity in retrospect: trends in retinopathyof prematurity over a 10-year period
2019	Navdeep Kaur	Orthoptist-led neurofibromatosis type 1 clinic at The Royal Children's Hospital, Melbourne. A strategy for impact

THE MARY WESSON AWARD

1983	Diana Craig (Inaugural)	1998	Not Awarded	2011	Zoran Georgievski)
1986	Neryla Jolly	2001	Heather Pettigrew	2014	Mara Giribaldi
1989	Not awarded	2004	Ann Macfarlane	2017	Keren Edwards
1992	Kerry Fitzmaurice	2008	Julie Barbour		
1995	Margaret Doyle	2010	Elaine Cornell		

ZORAN GEORGIEVSKI MEDAL

2012	Neryla Jolly (Inaugural)	2015	Sue Silveira	2018	Catherine Mancuso
2013	Connie Koklanis	2016	Julie Barbour	2019	Marion Rivers
2014	Linda Santamaria	2017	Meri Vukicevic		

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1949-50	E D'Ombrain
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1954-5	Diana Mann
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1956-7	Mary Carter
1957-8	Lucille Retalic
1958-9	Mary Peoples
1959-60	Patricia Lance
1960-1	Helen Hawkeswood
1961-2	Jess Kirby
1962-3	Patricia Lance
1963-4	Leonie Collins
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1965-6	Beverly Balfour
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1968-9	Diana Craig
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1970-1	Neryla Heard
1971-2	Jill Taylor
1972-3	Patricia Lance
1973-4	Jill Taylor
1974-5	Patricia Lance
1975-6	Megan Lewis
1976-7	Vivienne Gordon
1977-8	Helen Hawkeswood
1978-9	Patricia Dunlop
1979-80	Mary Carter
1980-1	Keren Edwards
1981-82	Marion Rivers
1982-3	Jill Stewart
1983-5	Neryla Jolly
1985-6	Geraldine McConaghy
1986-7	Alison Terrell
1987-9	Margaret Doyle
1989-91	Leonie Collins
1991-3	Anne Fitzgerald
1993-5	Barbara Walsh
1995-7	Jan Wulff
1997-00	Kerry Fitzmaurice
2000-2	Kerry Martin
2002-4	Val Tosswill
2004-6	Julie Barbour
2006-8	Heather Pettigrew
2008-10	Zoran Georgievski
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2015-16	Paul Cawood
2016-17	Julie Hall
2017-18	Marion Rivers
2018-19	Marion Rivers

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Vol 8 1966	Barbara Lewin & Ann Metcalfe
Vol 9 1969	Barbara Dennison & Neryla Heard
Vol 10 1970	Neryla Heard
Vol 11 1971	Neryla Heard & Helen Hawkeswood
Vol 12 1972	Helen Hawkeswood
Vol 13 1973-74	Diana Craig
Vol 14 1975	Diana Craig
Vol 15 1977	Diana Craig
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Vol 18 1980-81	Diana Craig
Vol 19 1982	Diana Craig
Vol 20 1983	Margaret Doyle
Vol 21 1984	Margaret Doyle
Vol 22 1985	Margaret Doyle
Vol 23 1986	Elaine Cornell
Vol 24 1987	Elaine Cornell
Vol 25 1989	Elaine Cornell
Vol 26 1990	Elanie Cornell
Vol 27 1991	Julia Kelly
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Vol 30 1994	Alison Pitt
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Vol 33 1997-98	Julie Green
Vol 34 1999	Julie Green
Vol 35 2000	Neryla Jolly & Nathan Moss
Vol 36 2001-02	Neryla Jolly & Kathryn Thompson
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Vol 39 2007	Zoran Georgievski & Connie Koklanis
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Vol 51 2019	Meri Vukicevic & Linda Santamaria

Reviewers of the Australian Orthoptic Journal (2015-2019)

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