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A Review of Referrals Reveal the Impact of Referral Content on the Triage and Management of Ophthalmology Wait Lists

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-047246
Article Type:	Original research
Date Submitted by the Author:	23-Nov-2020
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Keywords:	OPHTHALMOLOGY, PUBLIC HEALTH, Cataract and refractive surgery < OPHTHALMOLOGY

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A Review of Referrals Reveal the Impact of Referral Content on the Triage and Management of Ophthalmology Wait Lists

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Word Count: 2,838

Tables: 5

Figures: 0

Key Words

ophthalmology, public hospital**,** referrals, triage, wait lists

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Abstract

Objectives: Many chronic eye conditions are managed within public hospital ophthalmology clinics resulting in encumbered wait lists. Integrated care schemes can increase system capacity. In order to direct implementation of a public hospital-based integrated eye care model, this study aims to evaluate the quality of referrals for new patients through information content, assess triage decisions of newly referred patients, and evaluate the consistency of referral content for new patients referred multiple times.

Design: A retrospective and prospective review of all referral forms for new patients referred to a public hospital ophthalmology clinic between January 2016 and September 2017, and September 2017 and August 2018, respectively.

Setting: A referral-only public hospital ophthalmology clinic in metropolitan Sydney, Australia.

Participants: 418 new patients on existing non-urgent wait lists waiting to be allocated an initial appointment, and 528 patients that were newly referred.

Primary and secondary outcome measures: The primary outcome was the information content of referrals for new patients. The secondary outcomes were triage outcomes for new incoming referrals, and the number of new patients with multiple referrals.

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Results: Of the wait-listed referrals, 0.2% were complete in referral content compared to 9.8% of new incoming referrals (P < 0.001). Of new incoming referrals, 56.7% were triaged to a non-urgent clinic. Multiple referrals were received for 49 patients, with no change in the amount of referral content.

Conclusions: Referrals were incomplete in content, leading to triage based on limited clinical information. Some new patients were referred multiple times with their second referral containing a similar amount of content as their first. Lengthy wait lists could be prevented by improving administrative processes and communication between the referral centre and referrers. The future implementation of an integrated eye care model at the studied setting could sustainably cut wait lists for patients with chronic eye conditions.

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Article Summary

Strengths and Limitations of this Study

Strengths

- This study reviewed all referrals for new patients to a public hospital eye clinic, regardless of the ocular condition for which they were referred. A condition of inclusion was that an initial appointment had not yet been made.

- This study was also able to identify the number of patients who had been referred to a public hospital eye clinic multiple times but were yet to receive an initial appointment at the clinic.

Limitations

- This study did not measure the wait time between the receipt of referral and date of the patient's initial appointment as an outcome.

- As reasons for referral were categorised within four groups, the number of patients referred for a second time may have been underestimated.

- The categorisation of referrers by their profession meant that repeat referrals from another practitioner within the same profession were not captured in the data.

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Introduction

Increasing life expectancy and declining fertility rates worldwide have resulted in an ageing population.[1] Concurrently, contemporary lifestyle choices have contributed to the prevalence of chronic health conditions in the elderly.[2] This includes chronic, progressive eye disorders which are increasingly prevalent with age.[3] These disorders typically require periodic follow-up to re-assess risk status, establish diagnosis, manage progression, and prevent potential complications,[4] creating a burden on health care systems.

Many chronic eye conditions are managed within public hospital outpatient and inpatient settings. Consequently, wait lists for clinic visits are an ongoing challenge, especially in publicly-funded healthcare systems.[5-7] Increasing demands on healthcare systems can reduce capacity for new patient intake, which, if not managed, impedes timely and appropriate access to services. For example, patients referred for cataract surgery compete for limited capacity, resulting in waits of over a year for an initial public hospital outpatient clinic assessment,[8] prior to then being placed on the elective surgery wait list.

Several models for the care and management of chronic eye disorders have been examined using referral refinement and/or collaborative care schemes[5 9-13] and have been shown to increase system capacity.[13] In order to inform future implementation of a novel hospital-based integrated care model that sustainably reduces wait lists, an assessment of wait-listed referrals is required.[14]

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Wait lists can become inflated due to incomplete referrals,[15] which can then cause the content of interminably queued referrals to become outdated. Referral quality, which is assessed on the completeness of referral content,[16] affects the appropriate triage of patients. In particular, the improper categorisation of high-risk patients as non-urgent and vice versa, delays appropriate patient management, resulting in poorer outcomes.[17] Referral quality may differ depending on the referrer's profession[8] and referral format,[18] and standardised referral templates can mitigate such issues.[6]

This study aims to scrutinise wait-listed referrals at a metropolitan public eye clinic by determining the quality of referrals for new patients, assess triage decisions, and evaluate the consistency of referrals for new patients referred multiple times.

Methods

Ethics Approval

This study adhered to the Declaration of Helsinki and ethics approval was provided by the Human Research Ethics Committee of the South Eastern Sydney Local Health District (Reference No.: 17/231) and a waiver of consent requirements was provided.

Patient and Public Involvement

Patients and the public were not involved in the design and conduct of this study.

Study Design

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Referrals at the Prince of Wales Hospital (POWH) Eye Clinic are currently triaged by an on-site ophthalmic nurse. If the referral is classified as non-urgent, the patient is placed on a non-urgent wait list. Otherwise, the patient is booked in for an appointment within a suitable time frame.

For the study, referrals were evaluated from three different scenarios: existing wait list referrals (Set A), new incoming referrals (Set B), and patients with multiple referrals (Set C). Each set of referrals represented new individual cases to the clinic and encompassed different characteristics (Table 1).

Set A: Existing Wait List Referrals

A retrospective analysis was performed on referrals as outlined in Table 1. The review period was left open to ensure all referrals on the existing wait list were reviewed. Referrals for patients over the age of 18, and patients not under institutional or correctional care were included. The following referrals were excluded: (1) current or returning patients at all public hospital ophthalmology clinics within the same local health district (LHD), (2) new patients later found to have a booked future appointment at the POWH Eye Clinic, (3) patients where the referral was inaccessible, and (4) the patient was deceased since being referred. The resultant set of referrals represented new patients who were on the existing non-urgent clinical appointment wait list.

Set B: New Incoming Referrals

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A prospective analysis was performed on referrals as outlined in Table 1. The same inclusion and exclusion criteria as applied to Set A were used. The resultant set of referrals represented newly referred patients.

Set C: Multiple Referrals

When patients with multiple referrals were identified from Sets A and B, the initial referral remained in Set A and B for analysis and was included in Set C for sub-analysis. Subsequent referrals for the corresponding patient were excluded from Sets A and B and included in Set C.

Data Extraction and Refinement

For all referral sets, the following fields were constructed for analysis: patient demographics, referrer profession, primary reason for referral, best reported visual acuity (VA) in the worse eye, signs and/or symptoms, specified urgency by the referrer, and referral format used. Triage decision was only collected for referrals in Sets B and C, since Set A represented non-urgent referrals.

The primary reason for referral was categorised by author LM as relating to anterior eye, cataract, general examination, or posterior eye. The first reason listed was categorised if multiple reasons were provided. Referrers were classified by profession. Reporting of urgency and VA were classified as present or absent. If VA was reported, it was classified as: better than 6/12, between 6/12 and better than 6/60, or 6/60 and worse. Reporting of signs/symptoms were categorised as: present, diagnosis reported only, or absent. Referral

format was categorised as handwritten letter, POWH Eye Clinic template, or computer-generated. Triage decision, which was written on the referral, was grouped by: seen within 1 month, seen within 3-6 months, seen within 6-12 months, general clinic non-urgent, cataract clinic non-urgent, specific doctor's clinic, or rejected.

Statistical Analysis

Statistical analyses were performed with SPSS (version 25, IBM, Armonk, USA) and Graphpad Prism (version 8, Graphpad, San Diego, USA). Demographic variables analysed included age, gender, and location of residence (derived from postcode). Variables considered for referral completeness, and hence quality, included primary reason for referral, VA, signs/symptoms, and urgency. Referrals with missing data were not excluded as referral completeness was an outcome. Kruskal-Wallis test and Fisher's exact test were used to ascertain statistical differences. McNemar's test and marginal homogeneity test were used to determine whether the amount of content provided in paired referrals in Set C changed. P values less than 0.05 were considered significant except for when a Bonferroni correction was applied.

Results

Set A: Existing Wait List Referrals

A total of 1,633 patients were on the wait list to be scheduled for an initial appointment. The following referrals were excluded: 649 (39.7%) were for returning patients awaiting recall, 32 (2.0%) could not be traced, 44 (2.7%) were multiple referrals and put aside for Set C, 474 (29.0%) were for patients with already completed or scheduled appointments, three (0.2%)

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were for now-deceased patients, and 13 (0.8%) were for patients under guardianship. Subsequently, referrals for 418 new patients, spanning from the 23rd of January 2016 to the 25th of September 2017, were analysed.

Set B: New Incoming Referrals

A total of 539 new patient referrals were received during the review period. Of these, 11 multiple referrals were set aside for Set C, resulting in a total of 528 referrals.

Set C: Multiple Referrals

Forty-nine patients were referred multiple times, with 43 referred twice, five referred three times, and one referred four times. Only second referrals were compared to initial referrals due to the small numbers of third and fourth referrals.

Patient Demographics

The demographics of the patients were similar in all analysed sets of referrals (Table 2). Referral rates from GPs and optometrists were similar between Sets A and B (P = 0.53). The proportion of patients referred from outside the LHD was also similar (P = 0.27), with 19.0% (n = 179) of all patients residing in another metropolitan LHD.

Quality of Referral Content of Set A and B

Overall, 0.2% (n = 1) of Set A referrals and 9.8% (n = 52, P < 0.001) of Set B referrals had a complete set of information. The information provided in referrals is presented in Table 3. A reason for referral was provided in all referrals. Cataract was the main reason for referral

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for both GPs and optometrists (Supplementary Table 1). Rates of reporting VA were lower for GPs compared to optometrists in both sets (both P < 0.001, Bonferroni corrected significance was P < 0.017) (Supplementary Table 2). GPs reported more often on diagnoses over signs/symptoms compared to optometrists in both sets (both P < 0.001, Bonferroni corrected significance was P < 0.017) (Supplementary Table 3).

Since no statistically significant difference was found for referral format, reporting of VA and signs/symptoms, the data for Sets A and B were pooled for analysis. A sign/symptom or a diagnosis were listed more often in handwritten letters (100%) and in the POWH Eye Clinic template (98.1%) compared to computer-generated referrals (88.0%) (both P < 0.001, Bonferroni corrected significance at P < 0.017). VA was listed more frequently in the POWH Eye Clinic template compared to computer-generated referrals and handwritten letters (85.2% and 37.7%, P < 0.001; and 56.8%, P < 0.001; Bonferroni corrected significance at P < 0.017), and listed more often in handwritten letters over computer-generated referrals (P = 0.002).

Triage Outcomes of Set B Referrals

The triage decisions for Set B Referrals are listed in Table 4. Overall, 56.7% (n = 299) were triaged to a non-urgent clinic. Within this, 8.4% (n = 25) did not provide a sign/symptom or diagnosis, and 48.5% (n = 145) did not provide a VA. For referrals triaged to be seen within one month, 57.5% (n = 46) did not provide a VA, 30.0% (n = 24) had vision better than 6/12 (Supplementary Table 4), and 16.3% (n = 13) did not provide a sign/symptom or diagnosis.

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Urgency was mentioned less frequently in referrals triaged to a non-urgent clinic, compared those triaged to be seen within a specific timeframe (12.4%, 24.0% respectively, P = 0.002).

Content of Referrals for Patients Referred Multiple Times

The mean time between first and second referrals was 141 ± 175 days, and 15 (30.6%) second referrals were sent within seven days after the first. The reporting of VA, signs/symptoms, and urgency did not change between referrals (Table 5). The referrer's profession was different between paired referrals in 51.0% of cases (n = 25, P < 0.001), although we were unable to discern changes in practitioner within the same profession. The reason for referral changed for 46.9% (n = 23, P < 0.001) of patients. The triage decision changed in 40.8% (n = 20, P < 0.001) of cases. Of the patients who were referred for the same reason on the second occasion, 37.2% (n = 16) were triaged differently.

Discussion

This study found that referrals for new patients reported on urgency, VA, and signs/symptoms to varying degrees, with little reporting on all three. Wait lists were inflated by referrals for patients no longer requiring an initial appointment, and by repeat referrals. For patients who were referred for a second time, the amount of content in both referrals was similar, but patients were referred for different reasons.

Suboptimal information content can subvert the triage process,[19] and in this study, a minority of referrals were found to be complete in information content. Yet, incomplete referrals are deemed to be acceptable by the ophthalmic nurse to triage. The interpretation of such requires significant experience and/or a level of triage training,[20] where inexperience can lead to a

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reluctance in rejecting referrals, and thus having to adapt to low information content risks less precise triage and inconsistencies. Thus, it is vital that referrals contain information including VA, signs/symptoms, and urgency. Symptoms indicate the functional impacts of conditions and VA is a fundamental component of the degree of visual impairment thereby dictating referral priority, even with non-urgent cases. For example, VA can decrease by 0.27 logMAR over a period of 13 months in patients who are wait listed for cataract,[21] and those with worse reported VA are generally prioritised. In the case of urgency, referrers may be unable to triage urgency and expect that the hospital would determine implied referral priority from VA and signs/symptoms. The implementation of referral templates has resulted in good quality referrals in other specialty fields.[22] While the clinic's referral template provided a prompt for VA and signs/symptoms, it was not widely used. Simply informing referrers of hospital wait times for assessment is enough to encourage uptake of referral templates.[23]

The analysis of the electronic wait list revealed that almost three-quarters of referrals did not require an initial appointment, consequently inflating the wait list. These were referrals where a) the patient was deceased, b) already under the care of the clinic, and c) already allocated an appointment, which were not being withdrawn from the wait list. This indicates a lack of a process for referrals to be withdrawn when no longer needed. Consequently, the number of patients on the wait list were inflated by administrative problems in managing appointments when given and in not being notified when the appointment was no longer needed. Improvements in waiting times can be expected from improved administrative processes, or reassessment of referrals on the wait list for appropriateness after an extended period can ameliorate this.[6] Moreover, interim optometric examinations to revise the information

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provided in referrals and/or possibly determine the need for the hospital visit can also reduce

wait lists.

Reasons for referral changed in almost half of patients who were referred for a second time

and were received from a different profession in half of the patients. Almost one in three

repeat referrals were received a week after the first referral. This could indicate that

information in a patient's referral needed revision because of the wait to be seen, or patients

themselves seeking a different referring practitioner for another opinion who knowingly or

unknowingly refers again. These scenarios highlight a need for improved communication

and feedback amongst the patient's relevant health professionals and the POWH Eye Clinic[24]

including confirmation of receipt of referrals, an indication of wait times, efforts to reduce

unnecessary repeat referrals, and in some cases alternative assessments with an optometrist,

to better target the provision of service and at the same time decrease wait time.

A proportion of patients referred to the POWH Eye clinic resided outside of its respective

LHD. Each metropolitan LHD within New South Wales, Australia is serviced by at least one

of ten Tier 2 adult outpatient ophthalmology clinics located within Sydney. The POWH Eye

Clinic is one of three clinics that does not actively discourage referrals for patients residing

outside of its respective LHD, but recommends the use of similar services within a patient's

respective LHD.[25] The intake of out-of-area patients can add to wait lists for an appointment,

however, this could be a flow-on effect from wait lists in other LHDs.[8] We were unable to

determine how many patients sought care simultaneously in multiple LHDs, who then accept

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the first appointment they are offered, while not necessarily cancelling their request at other LHDs.

A strength of this study was that it included all referrals of new patients to the POWH Eye Clinic, regardless of the primary reason for which they were referred. Other studies examining wait lists have typically examined referrals to eye clinics for a single condition,[7] [8 26-28] thereby neglecting referrals for other ocular conditions which would also add to the wait lists for referral-only eye clinics. Furthermore, this study examined the backlog of existing referrals for new patients already placed on the wait list, which only contained non-urgent referrals, as well as new incoming referrals for new patients, which included urgent and non-urgent referrals. By doing so, we were able to assess whether the information content of referrals differed between these two sets of referrals. Moreover, we could also track the number of new patients for whom multiple referrals had been received over the review period.

There are a number of limitations to this study. The reasons for referral were categorised into four overarching groups, which as a result, may underestimate the number of patients who were referred a second time under a different reason. An overestimation may also have occurred since secondary reasons for referral were not collected during this study and therefore matching reasons may have been missed. In addition to this, the classification of referrers by profession meant that second referrals from a different practitioner within the same profession were not represented in the data. Unlike other studies, this study did not

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investigate the wait times experienced by new patients,[8][26-28] as these patients did not have an allocated appointment at the time of our referral review.

In conclusion, referrals to the POWH Eye Clinic were largely incomplete in content leading to triage decisions being made in many cases based on limited clinical information. Referral templates can help prompt for more information being provided and their consistent use can be expected to improve triage. Improved communication amongst the hospital and referrers needs to be addressed to prevent prolonged wait lists. The quantity of referrals on wait lists uncovered by this study justifies the need to develop an integrated care model to cut wait lists. Future work is now underway to determine the effectiveness of alternative models for assessment of patients facing long waits when their complaint is triaged to a non-urgent appointment category.

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Tables

Table 1. Characteristics of the Referral Sets

	Set A: Existing Wait List Referrals	Set B: New Incoming Referrals	Set C: Multiple Referrals
Inclusion Criterion	Retrospective analysis of referrals received prior to the 26th of September 2017	Prospective analysis of referrals between the 26th of September 2017 and 27th of August 2018	Subset of new patients on the existing wait list or newly referred
Appointment Status	New patients with no appointment scheduled	New patients with newly triaged referrals	New patients referred at least twice
Triage Status	Contains referrals triaged non-urgent only	Referrals triaged urgent and non-urgent	Referrals triaged urgent and non-urgent

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Table 2. Demographic Characteristics and Referrer Profession of Patients Referred to the Prince of Wales Hospital Eye Clinic

	Set A: Existing Wait List Referrals (n = 418)	Set B: New Incoming Referrals (n = 528)	Set C: Multiple Referrals (n = 49)	P value
Mean age, y ± SD	65.3 ± 14.5	66.4 ± 15.7	65.9 ± 14.4	0.18
Female, n (%)	244 (58.4)	296 (56.1)	29 (59.2)	0.75
LHD, n (%)				0.2
SESLHD	326 (78.0)	423 (80.9)	41 (83.7)	
Other Metropolitan LHD	89 (21.3)	90 (17.2)	8 (16.3)	
Regional/Rural LHD	3 (0.7)	10 (1.9)	0 (0.0)	
Referrer Profession, n (%)[†‡]				0.02
GP	190 (45.4)	214 (40.5)		
Optometrist	184 (44.0)	227 (43.0)		
Other[§]	44 (10.5)	87 (16.4)		

GP = General Practitioner; LHD = Local Heath District; SESLHD = South Eastern Sydney Local Health District

[†]Multiple referrals were not included as referrer profession may have differed between a patient's first and second referral.

[‡]Multiple pairwise Fisher's exact test showed no significant difference for GP vs. optometrist (P = 0.53), and for optometrist vs. other (P = 0.03) between the two referral sets. There was a significant difference for GP vs. other (P = 0.008) between the two sets. Bonferroni corrected significance was P < 0.017.

[§]Other included ophthalmologists and intra-hospital referrals.

Table 3. Contents of Referrals Received by the Prince of Wales Hospital Eye Clinic

	Set A: Existing Wait List Referrals	Set B: New Incoming Referrals	*P* value
Reason for Referral, n (%)			0.10
Anterior Eye	75 (17.9)	93 (17.6)	
Cataract	201 (48.1)	253 (47.9)	
General Examination	39 (9.3)	55 (10.4)	
Posterior Eye	103 (24.6)	127 (24.1)	
VA, n (%)			0.19
Present	191 (45.7)	265 (50.2)	
Absent	227 (54.3)	263 (49.8)	
Signs or Symptoms, n (%)			0.96
Present	271 (64.8)	347 (65.7)	
Diagnosis reported only	109 (26.1)	134 (25.4)	
Absent	38 (9.1)	47 (8.9)	
Urgency, n (%)			< 0.001
Present	11 (2.6)	77 (14.6)	
Absent	407 (97.4)	451 (85.4)	
Referral Format, n (%)			0.28
Handwritten Letter	36 (8.6)	39 (7.4)	
POWH Eye Clinic Template	81 (19.4)	124 (23.5)	
Computer-generated	301 (72.0)	365 (69.1)	

VA = Visual acuity; GP = General practitioner; POWH = Prince of Wales Hospital.

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Table 4. Triage Decisions for New Incoming Referrals at the Prince of Wales Hospital Eye Clinic

	New Incoming Referrals, n (%)
Triage Decision	
Within 1 month	80 (15.2)
3-6 months	70 (13.3)
6-12 months	4 (1.3)
General Clinic non-urgent	126 (23.9)
Cataract Clinic non-urgent	173 (32.8)
Specific Doctor's Clinic	67 (12.7)
Rejected	8 (1.5)

Table 5. Referral Content Between the First and Second Referral

	First Referral	Second Referral	P value
VA, n (%)			0.19
Present	24 (49.0)	17 (34.7)	
Absent	25 (51.0)	32 (65.3)	
Signs or Symptoms, n (%)			0.07
Present	38 (77.6)	30 (61.2)	
Diagnosis reported only	8 (16.3)	12 (25.4)	
Absent	3 (6.1)	7 (14.3)	
Urgency, n (%)			0.38
Present	2 (4.1)	5 (10.2)	
Absent	47 (95.9)	44 (89.8)	

VA = Visual acuity.

Funding

VK is supported by the Australian Government through the Research Training Program (RSAP1000). Guide Dogs NSW/ACT provides support for the Centre for Eye Health, salary support for AL, LM, MK, MY, and BZ, and a top-up scholarship for VK (RSRT6016).

Conflicts of Interests

The authors report no conflicts of interests.

Data Sharing

Summary data sets presented in the publication can be accessed on request. Individual data cannot be shared as per patient confidentiality agreements.

Acknowledgements

The authors would like to acknowledge Zoe Schrire and Sean Sivieng for work pertaining to data acquisition.

Author Statement

VK was involved in drafting of the manuscript, data analysis, and data interpretation. AL was involved in critical review of the manuscript, data analysis, and data interpretation. LM was involved in critical review of the manuscript, data analysis, and data interpretation. MM was involved in critical review of the manuscript, and data interpretation. MK was involved in critical review of the manuscript, and data interpretation. MY was involved in critical review of the manuscript, and conception. MPH was involved in critical review of the

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manuscript, and conception. BZ was involved in critical review of the manuscript, conception, data analysis, and data interpretation.

Supplementary Materials

Table 1. Reasons for Referral by Profession

		Anterior Eye	Cataract	General Examination	Posterior Eye
Set A: Existing Wait List, n (%)	GP[†]	52 (27.4)	62 (32.6)	32 (16.8)	44 (23.2)
	Optometrist[†§]	15 (8.2)	124 (67.4)	3 (1.63)	42 (22.8)
	Other[§]	8 (18.2)	15 (34.1)	4 (9.1)	17 (38.6)
Set B: New Incoming Referrals, n (%)	GP[‡]	53 (24.8)	79 (36.9)	34 (15.9)	48 (22.4)
	Optometrist[‡¶]	25 (11.0)	149 (65.6)	3 (1.3)	50 (22.0)
	Other[¶]	15 (17.2)	25 (28.7)	18 (20.7)	29 (33.3)

GP = General practitioner.

[†‡§¶]$P < 0.001$. Bonferroni corrected significance was $P < 0.017$.

Table 2. Presence of a Best Corrected Visual Acuity in Referrals by Profession

		VA Present	VA Absent
Set A: Existing Wait List, n (%)	GP[†]	11 (5.8)	179 (94.2)
	Optometrist[†]	168 (91.3)	16 (8.7)
	Other	12 (27.3)	32 (72.7)
Set B: New Incoming Referrals, n (%)	GP[‡]	21 (9.8)	193 (90.2)
	Optometrist[‡]	212 (93.4)	15 (6.6)
	Other	32 (36.8)	55 (63.2)

VA = Visual acuity; GP = General practitioner.

[†‡]P < 0.001. Bonferroni corrected significance was P < 0.017.

Table 3. Presence of a Sign or Symptom in Referrals by Profession

		Signs or Symptoms Present	Diagnosis Reported	Signs or Symptoms Absent
Set A: Existing Wait List, n (%)	GP[†]	81 (42.6)	77 (40.5)	32 (16.8)
	Optometrist[†]	167 (90.8)	15 (8.2)	2 (1.1)
	Other	23 (52.3)	17 (38.6)	4 (9.1)
Set B: New Incoming Referrals, n (%)	GP[‡]	101 (47.2)	83 (38.8)	30 (14.0)
	Optometrist[‡]	204 (89.9)	22 (9.7)	1 (0.4)
	Other	4 (57.1)	1 (14.3)	2 (28.6)

GP = General practitioner.

[†]P < 0.001, [‡]P < 0.001. Bonferroni corrected significance was P < 0.017.

Table 4. Triage Decision of Referrals with a Visual Acuity Provided

Triage Decision, n (%)	Better than 6/12	6/12 to better than 6/60	Worse than 6/60	Not Reported
Within 1 month	24 (30.0)	5 (6.3)	5 (6.3)	46 (57.5)
3-6 months	17 (24.3)	22 (31.4)	9 (12.9)	22 (31.4)
6-12 months	0 (0.0)	2 (50.0)	0 (0.0)	2 (50.0)
General Clinic non-urgent	22 (17.5)	17 (13.5)	5 (2.4)	84 (66.7)
Cataract Clinic non-urgent	28 (16.2)	79 (45.7)	5 (2.9)	61 (35.3)
Specific Doctor's Clinic	14 (20.9)	8 (11.9)	4 (6.0)	41 (61.2)
Rejected	0 (0.0)	1 (12.5)	0 (0.0)	7 (87.5)

Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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		Reporting Item	Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	#3	State specific objectives, including any prespecified hypotheses	6
Methods			

Study design	#4	Present key elements of study design early in the paper	7
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7-9
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	7
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	8
Bias	#9	Describe any efforts to address potential sources of bias	8-9
Study size	#10	Explain how the study size was arrived at	9
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	8-9
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	9
Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	9
Statistical methods	#12c	Explain how missing data were addressed	9
Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy	9
Statistical methods	#12e	Describe any sensitivity analyses	N/A

Results

Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	9
Participants	#13b	Give reasons for non-participation at each stage	N/A
Participants	#13c	Consider use of a flow diagram	N/A
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	10, 22
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	24
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-12
Main results	#16b	Report category boundaries when continuous variables were categorized	9-12
Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	9-12

Discussion

Key results	#18	Summarise key results with reference to study objectives	12
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	15

Interpretation	[#20]	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	12-15
Generalisability	[#21]	Discuss the generalisability (external validity) of the study results	16

Other Information

Funding	[#22]	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	27

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BMJ Open

A Review of Referrals Reveal the Impact of Referral Content on the Triage and Management of Ophthalmology Wait Lists

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-047246.R1
Article Type:	Original research
Date Submitted by the Author:	10-May-2021
Complete List of Authors:	Khou, Vincent; Centre for Eye Health; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health Ly, Angelica; Centre for Eye Health; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health Moore, Lindsay; Centre for Eye Health; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health Markoulli, Maria ; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health Kalloniatis, Michael; Centre for Eye Health; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health Yapp, Michael; Centre for Eye Health; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health Hennessy, Michael; Centre for Eye Health; Prince of Wales Hospital and Community Health Services, Department of Ophthalmology Zangerl, Barbara; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health
Primary Subject Heading:	Ophthalmology
Secondary Subject Heading:	Public health
Keywords:	OPHTHALMOLOGY, PUBLIC HEALTH, Cataract and refractive surgery < OPHTHALMOLOGY

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A Review of Referrals Reveal the Impact of Referral Content on the Triage and Management of Ophthalmology Wait Lists

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Word Count: 3,498

Tables: 5

Figures: 0

Key Words

ophthalmology, public hospital**,** referrals, triage, wait lists

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Abstract

Objectives: Many chronic eye conditions are managed within public hospital ophthalmology clinics resulting in encumbered wait lists. Integrated care schemes can increase system capacity. In order to direct implementation of a public hospital-based integrated eye care model, this study aims to evaluate the quality of referrals for new patients through information content, assess triage decisions of newly referred patients, and evaluate the consistency of referral content for new patients referred multiple times.

Design: A retrospective and prospective review of all referral forms for new patients referred to a public hospital ophthalmology clinic between January 2016 and September 2017, and September 2017 and August 2018, respectively.

Setting: A referral-only public hospital ophthalmology clinic in metropolitan Sydney, Australia.

Participants: 418 new patients on existing non-urgent wait lists waiting to be allocated an initial appointment, and 528 patients that were newly referred.

Primary and secondary outcome measures: The primary outcome was the information content of referrals for new patients. The secondary outcomes were triage outcomes for new incoming referrals, and the number of new patients with multiple referrals.

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Results: Of the wait-listed referrals, 0.2% were complete in referral content compared to 9.8% of new incoming referrals (P < 0.001). Of new incoming referrals, 56.7% were triaged to a non-urgent clinic. Multiple referrals were received for 49 patients, with no change in the amount of referral content.

Conclusions: Referrals were incomplete in content, leading to triage based on limited clinical information. Some new patients were referred multiple times with their second referral containing a similar amount of content as their first. Lengthy wait lists could be prevented by improving administrative processes and communication between the referral centre and referrers. The future implementation of an integrated eye care model at the study setting could sustainably cut wait lists for patients with chronic eye conditions.

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Article Summary

Strengths and Limitations of this Study

Strengths

- This study reviewed all referrals for new patients to a public hospital eye clinic, regardless of the ocular condition for which they were referred. A condition of inclusion was that an initial appointment had not yet been made.

- This study was also able to identify the number of patients who had been referred to a public hospital eye clinic multiple times but were yet to receive an initial appointment at the clinic.

Limitations

- This study did not measure the wait time between the receipt of referral and date of the patient's initial appointment as an outcome.

- As reasons for referral were categorised within four groups, the number of patients referred for a second time may have been underestimated.

- The categorisation of referrers by their profession meant that repeat referrals from another practitioner within the same profession were not captured in the data.

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Introduction

Increasing life expectancy and declining fertility rates worldwide have resulted in an ageing population.[1] Concurrently, contemporary lifestyle choices have contributed to the prevalence of chronic health conditions in the elderly.[2] This includes chronic, progressive eye disorders which are increasingly prevalent with age.[3] These disorders typically require periodic follow-up to re-assess risk status, establish diagnosis, manage progression, and prevent potential complications,[4] creating a burden on health care systems.

Many chronic eye conditions are managed within public hospital outpatient and inpatient settings. Consequently, wait lists for clinic visits are an ongoing challenge, especially in publicly-funded healthcare systems.[5-7] Increasing demands on healthcare systems can reduce capacity for new patient intake, which, if not managed, impedes timely and appropriate access to services. For example, patients referred for cataract surgery compete for limited capacity, resulting in waits of over a year for an initial public hospital outpatient clinic assessment,[8] prior to then being placed on the elective surgery wait list.

Several models for the care and management of chronic eye disorders have been examined using referral refinement and/or collaborative care schemes[5] [9-13] and have been shown to increase system capacity.[13] In order to inform future implementation of a novel hospital-based integrated care model that sustainably reduces wait lists, an assessment of wait-listed referrals is required.[14]

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Research regarding referral quality has generally explored the appropriateness of referrals to specialists by examining the diagnostic accuracy of referrals as well as interventions to improve referral appropriateness.[15-18] Referral quality has also been assessed through the completeness of referral content.[19-23] It is important to recognise that not all the information on referrals may be required for triage. For example, referrals providing either a presumed diagnosis or observed signs or symptoms may be sufficient for appropriate triage. Notwithstanding, all information provided in a referral could be insufficient for triage if the information is incorrect. Hence, diagnostic accuracy and completeness of referral content both affect the appropriate triage of patients. In particular, the improper categorisation of high-risk patients as non-urgent and vice versa, delays appropriate patient management, resulting in poorer outcomes.[24] Additionally, patients who are referred with incomplete referrals can experience longer wait times than those referred with more complete referrals as they may be perceived as less urgent.[25] Lengthy wait lists can also cause the content of interminably queued referrals to become outdated.[6] Referral quality may differ depending on the referrer's profession[8] and referral format,[26] and standardised referral templates can mitigate such issues.[6]

This study aims to scrutinise wait-listed referrals at a metropolitan public eye clinic by determining the quality of referrals for new patients, assess triage decisions, and evaluate the consistency of referrals for new patients referred multiple times.

Methods

Ethics Approval

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This study adhered to the Declaration of Helsinki and ethics approval was provided by the Human Research Ethics Committee of the South Eastern Sydney Local Health District (Reference No.: 17/231) and a waiver of consent requirements was provided.

Patient and Public Involvement

Patients and the public were not involved in the design and conduct of this study.

Study Design

Referrals at the Prince of Wales Hospital (POWH) Eye Clinic are currently triaged by an on-site ophthalmic nurse. Referrals reporting acute changes such as loss of vision, and red or painful eye; or indicating sight- or life-threatening conditions, such as retinal detachment, orbital cellulitis, or giant cell arteritis, are triaged as requiring urgent attention. If the referral is classified as non-urgent, the patient is placed on a non-urgent wait list. Otherwise, the patient is booked in for an appointment within a six-month time frame.

For the study, referrals were evaluated from three different scenarios: existing wait list referrals (Set A), new incoming referrals (Set B), and patients with multiple referrals (Set C). Set A was drawn from the list of outstanding referrals that remained on the wait list for an appointment for new patients as of the 26th of September 2017. Set B was drawn from all referrals received for new patients from the 26th of September 2017 until the 27th of August 2018. Wait lists for new patients are managed separately from returning patients. Returning patients are independently contacted and scheduled for the appropriate follow-up visits, which are prioritised over initial, non-urgent appointments for new patients.

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Set A: Existing Wait List Referrals

A retrospective analysis was performed on referrals as outlined in Table 1. The review period was left open to ensure all referrals on the existing wait list were reviewed. Referrals for patients over the age of 18, and patients not under institutional or correctional care were included. The following referrals were excluded: (1) current or returning patients at all public hospital ophthalmology clinics within the same local health district (LHD), (2) patients who were found to already have a booked future appointment at the POWH Eye Clinic, which arose from referrals not being removed from the wait list for an appointment, (3) patients where the referral was inaccessible, and (4) the patient was deceased since being referred. Referrals were only excluded once all referrals in Set A were collated and this was performed prior to the commencement of data analysis. The resultant set of referrals represented new patients who were on the existing non-urgent clinical appointment wait list.

Set B: New Incoming Referrals

Since Set A referrals were only representative of non-urgent referrals received by the POWH Eye Clinic, urgent referrals to the clinic were not captured in the retrospective analysis. Hence, a prospective analysis was also performed on referrals as outlined in Table 1. The analysis was conducted for referrals dated between the 26th of September 2017 and 27th of August 2018. The same inclusion and exclusion criteria as applied to Set A were used. Since referrals in Set B were prospectively collected, the criteria were applied within one week after the referrals were forwarded to us by the POWH Eye Clinic. Referrals were forwarded

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by the POWH Eye Clinic within one week. The resultant set of referrals represented newly referred patients.

Set C: Multiple Referrals

When patients with multiple referrals were identified from Sets A and B, the initial referral remained in Set A and B for analysis and was included in Set C for sub-analysis. Subsequent referrals for the corresponding patient were excluded from Sets A and B and included in Set C.

Data Extraction and Refinement

For all referral sets, the following data were collected for analysis: patient demographics, referrer profession, primary reason for referral, best reported visual acuity (VA) in the worse eye, signs and/or symptoms, specified urgency by the referrer, referral format used, and triage decision.

The primary reason for referral was categorised by author LM as relating to anterior eye, cataract, general examination, or posterior eye. The first reason listed was categorised if multiple reasons were provided. Referrers were classified by profession. Reporting of urgency and VA were classified as present or absent. If VA was reported, it was classified as: better than 6/12, between 6/12 and better than 6/60, or 6/60 and worse. Reporting of signs/symptoms were categorised as: present, diagnosis reported only, or absent. Referral format was categorised as handwritten letter, POWH Eye Clinic template, or computer-generated. Triage decision, which was written on the referral, was grouped by: seen within 1

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month, seen within 3-6 months, seen within 6-12 months, general clinic non-urgent, cataract clinic non-urgent, specific doctor's clinic, or rejected. Referrals that were triaged as seen within 6-12 months, general clinic non-urgent, or cataract clinic non-urgent were considered to be non-urgent for this study. Urgent referrals were defined as those requiring an appointment within 1 month.[27]

Statistical Analysis

Statistical analyses were performed with SPSS (version 25, IBM, Armonk, USA) and Graphpad Prism (version 8, Graphpad, San Diego, USA). Demographic variables analysed included age, gender, and location of residence (derived from postcode). Variables considered for referral completeness, and hence quality, included primary reason for referral, VA, signs/symptoms, and urgency. Referrals with missing data were not excluded as referral completeness was an outcome. Kruskal-Wallis test and Fisher's exact test were used to ascertain statistical differences. McNemar's test and marginal homogeneity test were used to determine whether the amount of content provided in paired referrals in Set C changed. P values less than 0.05 were considered significant except for when a Bonferroni correction was applied.

Results

Each set of referrals represented new individual cases to the clinic and encompassed different characteristics (Table 1).

Set A: Existing Wait List Referrals

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A total of 1,633 patients were on the wait list to be scheduled for an initial appointment. The following referrals were excluded: 649 (39.7%) were for returning patients awaiting recall, 32 (2.0%) could not be traced, 44 (2.7%) were multiple referrals and put aside for Set C, 474 (29.0%) were for patients with already completed or scheduled appointments, three (0.2%) were for now-deceased patients, and 13 (0.8%) were for patients under guardianship. Subsequently, referrals for 418 new patients, spanning from the 23rd of January 2016 to the 25th of September 2017, were analysed.

Set B: New Incoming Referrals

A total of 539 new patient referrals were received during the review period. Of these, 11 referrals were categorised as repeat referrals and were excluded from the original data set and separately analysed to form for Set C. All other referrals met the exclusion criteria resulting in a total of 528 referrals.

Set C: Multiple Referrals

Forty-nine patients were referred multiple times, with 43 referred twice, five referred three times, and one referred four times. Only second referrals were compared to initial referrals due to the small numbers of third and fourth referrals.

Patient Demographics

The demographics of the patients were similar in all analysed sets of referrals (Table 2). The number of referrals from GPs and optometrists were similar between Sets A and B (P = 0.53).

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The proportion of patients referred from outside the LHD was also similar (P = 0.27), with 19.0% (n = 179) of all patients residing in another metropolitan LHD.

Quality of Referral Content of Set A and B

Overall, 0.2% (n = 1) of Set A referrals and 9.8% (n = 52, P < 0.001) of Set B referrals had a complete set of information. The information provided in referrals is presented in Table 3. The presence of urgency was significantly different between Set A and Set B (P < 0.001). A reason for referral was provided in all referrals. Cataract was the main reason for referral for both GPs and optometrists (Supplementary Table 1). Rates of reporting VA were lower for GPs compared to optometrists in both sets (both P < 0.001, Bonferroni corrected significance was P < 0.017) (Supplementary Table 1). GPs reported more often on diagnoses over signs/symptoms compared to optometrists in both sets (both P < 0.001, Bonferroni corrected significance was P < 0.017) (Supplementary Table 1). Referrals from optometrists that reported both signs/symptoms and diagnosis were not significantly different between the two sets. Overall, 90.2% (n = 371) of referrals from optometrists contained both signs/symptoms and a diagnosis.

Since no statistically significant difference was found for referral format, reporting of VA and signs/symptoms, the data for Sets A and B were pooled for analysis. A sign/symptom or a diagnosis were listed more often in handwritten letters (100%) and in the POWH Eye Clinic template (98.1%) compared to computer-generated referrals (88.0%) (both P < 0.001, Bonferroni corrected significance at P < 0.017). VA was listed more frequently in the POWH Eye Clinic template compared to computer-generated referrals and handwritten letters

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(85.2% and 37.7%, P < 0.001; and 56.8%, P < 0.001; Bonferroni corrected significance at P < 0.017) and listed more often in handwritten letters over computer-generated referrals (P = 0.002).

Triage Outcomes of Referrals

All referrals from Set A were triaged as "general clinic non-urgent" (n = 418). The triage decisions for Set B Referrals are listed in Table 4. Overall, 56.7% (n = 299) were triaged to a non-urgent clinic. There were no significance differences in the presence of urgency in referrals triaged "within 1 month" compared to those triaged "6-12 months", "general clinic non-urgent", and "cataract clinic non-urgent" (P = 0.56, P = 0.005, P = 0.05, respectively, Bonferroni corrected significance at P < 0.0025). Within this, 8.4% (n = 25) did not provide a sign/symptom or diagnosis, and 48.5% (n = 145) did not provide a VA. For referrals triaged to be seen within one month, 57.5% (n = 46) did not provide a VA, 30.0% (n = 24) had vision better than 6/12 (Supplementary Table 2), and 16.3% (n = 13) did not provide a sign/symptom or diagnosis. Urgency was mentioned less frequently in referrals triaged to a non-urgent clinic, compared those triaged to be seen within a specific timeframe (12.4%, 24.0% respectively, P = 0.002).

Content of Referrals for Patients Referred Multiple Times

The mean time between first and second referrals was 141 ± 175 days, and 15 (30.6%) second referrals were sent within seven days after the first. The reporting of VA, signs/symptoms, and urgency did not change between referrals (Table 5). The referrer's profession was different between paired referrals in 51.0% of cases (n = 25, P < 0.001), although we were

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unable to discern changes in practitioner within the same profession. The reason for referral changed for 46.9% (n = 23, P < 0.001) of patients. The triage decision changed in 40.8% (n = 20, P < 0.001) of cases. Of the patients who were referred for the same reason on the second occasion, 37.2% (n = 16) were triaged differently.

Discussion

This study found that referrals for new patients reported on urgency, VA, and signs/symptoms to varying degrees, with little reporting on all three. Wait lists were inflated by referrals for patients with already completed or scheduled appointments, and by repeat referrals. For patients who were referred for a second time, the amount of content in both referrals was similar, but patients were referred for different reasons.

Suboptimal information content can subvert the triage process,[28] and in this study, a minority of referrals were found to be complete in information content. Yet, incomplete referrals are deemed to be acceptable by the ophthalmic nurse to triage. The interpretation of such requires significant experience and/or a level of triage training,[29] where inexperience can lead to a reluctance in rejecting referrals, and thus having to adapt to low information content risks less precise triage and inconsistencies. Thus, it is vital that referrals contain information including VA, signs/symptoms, and urgency. Symptoms indicate the functional impacts of conditions and VA is a fundamental component of the degree of visual impairment thereby dictating referral priority, even with non-urgent cases. For example, VA can decrease by 0.27 logMAR over a period of 13 months in patients who are wait listed for cataract,[30] and those with worse reported VA are generally prioritised. In the case of urgency, referrers may be

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unable to triage urgency and expect that the hospital would determine implied referral priority from VA and signs/symptoms. The implementation of referral templates has resulted in good quality referrals in other specialty fields.[31] While the clinic's referral template provided a prompt for VA and signs/symptoms, it was not widely used. Simply informing referrers of hospital wait times for assessment is enough to encourage uptake of referral templates.[32]

The analysis of the electronic wait list revealed that almost three-quarters of referrals did not require an initial appointment, consequently inflating the wait list. These were referrals where a) the patient was deceased, b) already under the care of the clinic, and c) already allocated an appointment, which were not being withdrawn from the wait list. This indicates a lack of a process for referrals to be withdrawn when no longer needed. Consequently, the number of patients on the wait list were inflated by administrative problems in managing appointments when given and in not being notified when the appointment was no longer needed. Improvements in waiting times can be expected from improved administrative processes, or reassessment of referrals on the wait list for appropriateness after an extended period can ameliorate this.[6] Moreover, interim optometric examinations to revise the information provided in referrals and/or possibly determine the need for the hospital visit can also reduce wait lists.

Reasons for referral changed in almost half of patients who were referred for a second time and were received from a different profession in half of the patients. Almost one in three repeat referrals were received a week after the first referral. This could indicate that information in a patient's referral needed revision because of the wait to be seen, or patients

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themselves seeking a different referring practitioner for another opinion who knowingly or unknowingly refers again. These scenarios highlight a need for improved communication and feedback amongst the patient's relevant health professionals and the POWH Eye Clinic[33] including confirmation of receipt of referrals, an indication of wait times, efforts to reduce unnecessary repeat referrals, and in some cases alternative assessments with an optometrist, to better target the provision of service and at the same time decrease wait time.

A proportion of patients referred to the POWH Eye clinic resided outside of its respective LHD. Each metropolitan LHD within New South Wales, Australia is serviced by at least one of ten Tier 2 adult outpatient ophthalmology clinics located within Sydney. The POWH Eye Clinic is one of three clinics that does not actively discourage referrals for patients residing outside of its respective LHD, but recommends the use of similar services within a patient's respective LHD.[34] The intake of out-of-area patients can add to wait lists for an appointment, however, this could be a flow-on effect from wait lists in other LHDs.[8] We were unable to determine how many patients sought care simultaneously in multiple LHDs, who then accept the first appointment they are offered, while not necessarily cancelling their request at other LHDs.

A strength of this study was that it included all referrals of new patients to the POWH Eye Clinic, regardless of the primary reason for which they were referred. Other studies examining wait lists have typically examined referrals to eye clinics for a single condition,[7] [8 35-37] thereby neglecting referrals for other ocular conditions which would also add to the wait lists for referral-only eye clinics. Furthermore, this study examined the backlog of

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existing referrals for new patients already placed on the wait list, which only contained non-urgent referrals, as well as new incoming referrals for new patients, which included urgent and non-urgent referrals. By doing so, we were able to assess whether the information content of referrals differed between these two sets of referrals. Moreover, we could also track the number of new patients for whom multiple referrals had been received over the review period.

There are a number of limitations to this study. Referrals in Set A, by design, were heavily biased towards non-urgent referrals, and therefore would not be representative of all referrals received by the POWH Eye Clinic. However, this was addressed with the inclusion of referrals in Set B which represented all new incoming referrals and included urgent referrals. At the same time, for Set B, we were unable to ascertain whether all referrals had been forwarded from the POWH Eye Clinic. The reasons for referral were also categorised into four overarching groups, which as a result, may underestimate the number of patients who were referred a second time under a different reason. An overestimation may also have occurred since secondary reasons for referral were not collected during this study and therefore matching reasons may have been missed. In addition to this, the classification of referrers by profession meant that second referrals from a different practitioner within the same profession were not represented in the data. Unlike other studies, this study did not investigate the wait times experienced by new patients,[8 35-37] as these patients did not have an allocated appointment at the time of our referral review. Similarly, as these patients had not been examined by the POWH Eye Clinic, this study was not able to assess the diagnostic accuracy of referrals. Within the context of this study, referral quality was therefore limited

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to assessing completeness of referral content, even though it could be evaluated through the diagnostic accuracy of referrals.[15][16] Consequently, referrals that are fully completed can still incur inappropriate patient triage if the content of the referral, especially the diagnosis, is insufficient, inaccurate, or incorrect.

In conclusion, referrals to the POWH Eye Clinic were largely incomplete in content leading to triage decisions being made in many cases based on limited clinical information. Referral templates can help prompt for more information being provided and their consistent use can be expected to improve triage. Improved communication amongst the hospital and referrers needs to be addressed to prevent prolonged wait lists. The quantity of referrals on wait lists uncovered by this study justifies the need to develop an integrated care model to cut wait lists. Future work is now underway to determine the effectiveness of alternative models for assessment of patients facing long waits when their complaint is triaged to a non-urgent appointment category.

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Tables

Table 1. Characteristics of the Referral Sets

	Set A: Existing Wait List Referrals	Set B: New Incoming Referrals	Set C: Multiple Referrals
Inclusion Criterion	Retrospective analysis of referrals received prior to the 26th of September 2017	Prospective analysis of referrals between the 26th of September 2017 and 27th of August 2018	Subset of new patients on the existing wait list or newly referred
Appointment Status	New patients with no appointment scheduled	New patients with newly triaged referrals	New patients referred at least twice
Triage Status	Contains referrals triaged non-urgent only	Referrals triaged urgent and non-urgent	Referrals triaged urgent and non-urgent

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Table 2. Demographic Characteristics and Referrer Profession of Patients Referred to the Prince of Wales Hospital Eye Clinic

	Set A: Existing Wait List Referrals (n = 418)	Set B: New Incoming Referrals (n = 528)	Set C: Multiple Referrals (n = 49)	P value
Mean age, y ± SD	65.3 ± 14.5	66.4 ± 15.7	65.9 ± 14.4	0.18
Female, n (%)	244 (58.4)	296 (56.1)	29 (59.2)	0.75
LHD, n (%)				0.2
SESLHD	326 (78.0)	423 (80.9)	41 (83.7)	
Other Metropolitan LHD	89 (21.3)	90 (17.2)	8 (16.3)	
Regional/Rural LHD	3 (0.7)	10 (1.9)	0 (0.0)	
Referrer Profession, n (%)[†‡]				0.02
GP	190 (45.4)	214 (40.5)		
Optometrist	184 (44.0)	227 (43.0)		
Other[§]	44 (10.5)	87 (16.4)		

GP = General Practitioner; LHD = Local Heath District; SESLHD = South Eastern Sydney Local Health District

[†]Multiple referrals were not included as referrer profession may have differed between a patient's first and second referral.

[‡]Multiple pairwise Fisher's exact test showed no significant difference for GP vs. optometrist (P = 0.53), and for optometrist vs. other (P = 0.03) between the two referral sets. There was a significant difference for GP vs. other (P = 0.008) between the two sets. Bonferroni corrected significance was P < 0.017.

[§]Other included ophthalmologists and intra-hospital referrals.

Table 3. Contents of Referrals Received by the Prince of Wales Hospital Eye Clinic

	Set A: Existing Wait List Referrals	Set B: New Incoming Referrals	*P* value
Reason for Referral, n (%)			0.10
Anterior Eye	75 (17.9)	93 (17.6)	
Cataract	201 (48.1)	253 (47.9)	
General Examination	39 (9.3)	55 (10.4)	
Posterior Eye	103 (24.6)	127 (24.1)	
VA, n (%)			0.19
Present	191 (45.7)	265 (50.2)	
Absent	227 (54.3)	263 (49.8)	
Signs or Symptoms, n (%)			0.96
Present	271 (64.8)	347 (65.7)	
Diagnosis reported only	109 (26.1)	134 (25.4)	
Absent	38 (9.1)	47 (8.9)	
Urgency, n (%)			< 0.001
Present	11 (2.6)	77 (14.6)	
Absent	407 (97.4)	451 (85.4)	
Referral Format, n (%)			0.28
Handwritten Letter	36 (8.6)	39 (7.4)	
POWH Eye Clinic Template	81 (19.4)	124 (23.5)	
Computer-generated	301 (72.0)	365 (69.1)	

VA = Visual acuity; GP = General practitioner; POWH = Prince of Wales Hospital.

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Table 4. Triage Decisions for New Incoming Referrals at the Prince of Wales Hospital Eye Clinic and the Presence of Urgency in Referrals

	New Incoming Referrals, n (%)	Urgency Present, n (%)	Urgency Absent, n (%)
Triage Decision			
Within 1 month[†]	80 (15.2)	20 (25.0)	60 (75.0)
3-6 months[‡]	70 (13.3)	17 (24.3)	53 (75.7)
6-12 months	4 (1.3)	0 (0.0)	4 (100.0)
General Clinic non-urgent	126 (23.9)	12 (9.5)	114 (90.5)
Cataract Clinic non-urgent	173 (32.8)	25 (14.5)	148 (85.5)
Specific Doctor's Clinic[†‡]	67 (12.7)	3 (4.5)	64 (95.5)
Rejected	8 (1.5)	0 (0.0)	8 (100.0)

[†]Multiple pairwise Fisher's exact test showed a significant difference of $P < 0.001$ for presence of urgency in referrals. [‡] Multiple pairwise Fisher's exact test showed a significant difference of $P = 0.002$ for presence of urgency in referrals. Bonferroni corrected significance was $P < 0.0025$.

Table 5. Referral Content Between the First and Second Referral

	First Referral	Second Referral	P value
VA, n (%)			0.19
Present	24 (49.0)	17 (34.7)	
Absent	25 (51.0)	32 (65.3)	
Signs or Symptoms, n (%)			0.07
Present	38 (77.6)	30 (61.2)	
Diagnosis reported only	8 (16.3)	12 (25.4)	
Absent	3 (6.1)	7 (14.3)	
Urgency, n (%)			0.38
Present	2 (4.1)	5 (10.2)	
Absent	47 (95.9)	44 (89.8)	

VA = Visual acuity.

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Conflicts of Interests

The authors report no conflicts of interests.

Data Sharing

Summary data sets presented in the publication can be accessed on request. Individual data cannot be shared as per patient confidentiality agreements.

Ethics Statement

This study adhered to the Declaration of Helsinki and ethics approval was provided by the Human Research Ethics Committee of the South Eastern Sydney Local Health District (Reference No.: 17/231) and a waiver of consent requirements was provided.

Author Statement

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VK was involved in drafting of the manuscript, data analysis, and data interpretation. AL was involved in critical review of the manuscript, data analysis, and data interpretation. LM was involved in critical review of the manuscript, data analysis, and data interpretation. MM was involved in critical review of the manuscript, and data interpretation. MK was involved in critical review of the manuscript, and data interpretation. MY was involved in critical review of the manuscript, and conception. MH was involved in critical review of the manuscript, and conception. BZ was involved in critical review of the manuscript, conception, data analysis, and data interpretation.

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Supplementary Materials

Table 1. Information Content of Referrals by Profession

		Reason for Referral				Presence of VA		Presence of a Sign or Symptom		
		Anterior Eye	Cataract	General Examination	Posterior Eye	VA Present	VA Absent	Signs or Symptoms Present	Diagnosis Reported	Signs or Symptoms Absent
Set A: Existing Wait List, n (%)	GP[1,5,7]	52 (27.4)	62 (32.6)	32 (16.8)	44 (23.2)	11 (5.8)	179 (94.2)	81 (42.6)	77 (40.5)	32 (16.8)
	Optometrist[1,3,5,7]	15 (8.2)	124 (67.4)	3 (1.63)	42 (22.8)	168 (91.3)	16 (8.7)	167 (90.8)	15 (8.2)	2 (1.1)
	Other3	8 (18.2)	15 (34.1)	4 (9.1)	17 (38.6)	12 (27.3)	32 (72.7)	23 (52.3)	17 (38.6)	4 (9.1)
Set B: New Incoming Referrals, n (%)	GP[2,6,8]	53 (24.8)	79 (36.9)	34 (15.9)	48 (22.4)	21 (9.8)	193 (90.2)	101 (47.2)	83 (38.8)	30 (14.0)
	Optometrist[2,4,6,8]	25 (11.0)	149 (65.6)	3 (1.3)	50 (22.0)	212 (93.4)	15 (6.6)	204 (89.9)	22 (9.7)	1 (0.4)
	Other[4]	15 (17.2)	25 (28.7)	18 (20.7)	29 (33.3)	32 (36.8)	55 (63.2)	4 (57.1)	1 (14.3)	2 (28.6)

GP = General practitioner, VA = Visual acuity.

[1,2,3,4] $P < 0.001$ for reason for referral. [5,6] $P < 0.001$ for presence of visual acuity. [7,8] $P < 0.001$ for presence of a sign or symptom. Bonferroni corrected significance was $P < 0.017$.

Table 2. Triage Decision of Referrals with a Visual Acuity Provided

Triage Decision, n (%)	Better than 6/12	6/12 to better than 6/60	Worse than 6/60	Not Reported
Within 1 month	24 (30.0)	5 (6.3)	5 (6.3)	46 (57.5)
3-6 months	17 (24.3)	22 (31.4)	9 (12.9)	22 (31.4)
6-12 months	0 (0.0)	2 (50.0)	0 (0.0)	2 (50.0)
General Clinic non-urgent	22 (17.5)	17 (13.5)	5 (2.4)	84 (66.7)
Cataract Clinic non-urgent	28 (16.2)	79 (45.7)	5 (2.9)	61 (35.3)
Specific Doctor's Clinic	14 (20.9)	8 (11.9)	4 (6.0)	41 (61.2)
Rejected	0 (0.0)	1 (12.5)	0 (0.0)	7 (87.5)

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		Reporting Item	Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	#3	State specific objectives, including any prespecified hypotheses	6
Methods			

Study design	#4	Present key elements of study design early in the paper	7
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7-9
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	7
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	8
Bias	#9	Describe any efforts to address potential sources of bias	8-9
Study size	#10	Explain how the study size was arrived at	9
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	8-9
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	9
Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	9
Statistical methods	#12c	Explain how missing data were addressed	9
Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy	9
Statistical methods	#12e	Describe any sensitivity analyses	N/A

Results

Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	9	
Participants	#13b	Give reasons for non-participation at each stage	N/A	
Participants	#13c	Consider use of a flow diagram	N/A	
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	10, 22	
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	N/A	
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	24	
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-12	
Main results	#16b	Report category boundaries when continuous variables were categorized	9-12	
Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A	
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	9-12	

Discussion

Key results	#18	Summarise key results with reference to study objectives	12	
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	15	

Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	12-15
Generalisability	#21	Discuss the generalisability (external validity) of the study results	16

Other Information

Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	27

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A Review of Referrals Reveal the Impact of Referral Content on the Triage and Management of Ophthalmology Wait Lists

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A Review of Referrals Reveal the Impact of Referral Content on the Triage and Management of Ophthalmology Wait Lists

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Word Count: 3,673

Tables: 5

Figures: 0

Supplementary Tables: 3

Key Words: ophthalmology, public hospital, referrals, triage, wait lists

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Abstract

Objectives: Many chronic eye conditions are managed within public hospital ophthalmology clinics resulting in encumbered wait lists. Integrated care schemes can increase system capacity. In order to direct implementation of a public hospital-based integrated eye care model, this study aims to evaluate the quality of referrals for new patients through information content, assess triage decisions of newly referred patients, and evaluate the consistency of referral content for new patients referred multiple times.

Design: A retrospective and prospective review of all referral forms for new patients referred to a public hospital ophthalmology clinic between January 2016 and September 2017, and September 2017 and August 2018, respectively.

Setting: A referral-only public hospital ophthalmology clinic in metropolitan Sydney, Australia.

Participants: 418 new patients on existing non-urgent wait lists waiting to be allocated an initial appointment, and 528 patients that were newly referred.

Primary and secondary outcome measures: The primary outcome was the information content of referrals for new patients. The secondary outcomes were triage outcomes for new incoming referrals, and the number of new patients with multiple referrals.

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Results: Of the wait-listed referrals, 0.2% were complete in referral content compared to 9.8% of new incoming referrals (P < 0.001). Of new incoming referrals, 56.7% were triaged to a non-urgent clinic. Multiple referrals were received for 49 patients, with no change in the amount of referral content.

Conclusions: Most referrals were incomplete in content, leading to triage based on limited clinical information. Some new patients were referred multiple times with their second referral containing a similar amount of content as their first. Lengthy wait lists could be prevented by improving administrative processes and communication between the referral centre and referrers. The future implementation of an integrated eye care model at the study setting could sustainably cut wait lists for patients with chronic eye conditions.

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Article Summary

Strengths and Limitations of this Study

Strengths

- This study reviewed all referrals for new patients to a public hospital eye clinic, regardless of the ocular condition for which they were referred. A condition of inclusion was that an initial appointment had not yet been made.

- This study was also able to identify the number of patients who had been referred to a public hospital eye clinic multiple times but were yet to receive an initial appointment at the clinic.

Limitations

- This study did not measure the wait time between the receipt of referral and date of the patient's initial appointment as an outcome.

- As reasons for referral were categorised within four groups, the number of patients referred for a second time may have been underestimated.

- The categorisation of referrers by their profession meant that repeat referrals from another practitioner within the same profession were not captured in the data.

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Introduction

Increasing life expectancy and declining fertility rates worldwide have resulted in an ageing population.[1] Concurrently, contemporary lifestyle choices have contributed to the prevalence of chronic health conditions in the elderly.[2] This includes chronic, progressive eye disorders which are increasingly prevalent with age.[3] These disorders typically require periodic follow-up to re-assess risk status, establish diagnosis, manage progression, and prevent potential complications,[4] creating a burden on health care systems.

Many chronic eye conditions are managed within public hospital outpatient and inpatient settings. Consequently, wait lists for clinic visits are an ongoing challenge in publicly-funded healthcare systems.[5-7] Increasing demands on public healthcare systems can reduce capacity for new patient intake, which, if not managed, impedes timely and appropriate access to services. For example, patients referred for cataract surgery compete for limited capacity, resulting in waits of over a year for an initial public hospital outpatient clinic assessment,[8] prior to then being placed on the elective surgery wait list.

Several models for the care and management of chronic eye disorders have been examined using referral refinement and/or collaborative care schemes[5 9-13] and have been shown to increase system capacity.[13] In order to inform future implementation of a novel hospital-based integrated care model that sustainably reduces wait lists, an assessment of wait-listed referrals is required.[14]

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Research regarding referral quality has generally explored the appropriateness of referrals to specialists by examining the diagnostic accuracy of referrals as well as interventions to improve referral appropriateness.[10 15-19] Referral quality has also been assessed through the completeness of referral content.[19-23] It is important to recognise that not all the information on referrals may be required for triage. For example, referrals providing either a presumed diagnosis or observed signs or symptoms may be sufficient for appropriate triage. Notwithstanding, all information provided in a referral could be insufficient for triage if the information is incorrect. Hence, diagnostic accuracy and completeness of referral content both affect the appropriate triage of patients. In particular, the improper categorisation of high-risk patients as non-urgent and vice versa, delays appropriate patient management, resulting in poorer outcomes.[24] Additionally, patients who are referred with incomplete referrals can experience longer wait times than those referred with more complete referrals as they may be perceived as less urgent.[25] Lengthy wait lists can also cause the content of interminably queued referrals to become outdated.[6] Referral quality may differ depending on the referrer's profession[8] and referral format,[26] and standardised referral templates can mitigate such issues.[6]

This study aims to scrutinise wait-listed referrals at a metropolitan public eye clinic by determining the quality of referrals for new patients, assess triage decisions, and evaluate the consistency of referrals for new patients referred multiple times.

Methods

Ethics Approval

This study adhered to the Declaration of Helsinki and ethics approval was provided by the Human Research Ethics Committee of the South Eastern Sydney Local Health District (Reference No.: 17/231) and a waiver of consent requirements was provided.

Patient and Public Involvement

Patients and the public were not involved in the design and conduct of this study.

Prince of Wales Hospital Eye Clinic Triage Protocol and Appointment Process

Referrals at the Prince of Wales Hospital (POWH) Eye Clinic are currently triaged by an on-site ophthalmic nurse. Referrals reporting acute changes such as loss of vision, and red or painful eye; or indicating sight- or life-threatening conditions, such as retinal detachment, orbital cellulitis, or giant cell arteritis, are triaged as requiring urgent attention. If the referral is classified as non-urgent, the patient is placed on a non-urgent wait list. Otherwise, the patient is booked in for an appointment within a six-month time frame. Wait lists for new patients are managed separately from returning patients. Returning patients are independently contacted and scheduled for the appropriate follow-up visits, which are prioritised over initial, non-urgent appointments for new patients.

Study Design

For the study, referrals were evaluated from three different scenarios: existing wait list referrals (Set A), new incoming referrals (Set B), and patients with multiple referrals (Set C). Set A was drawn from the list of outstanding referrals that remained on the wait list for an appointment for new patients as of the 26th of September 2017. Set B was drawn from all

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referrals received for new patients from the 26th of September 2017 until the 27th of August 2018.

Set A: Existing Wait List Referrals

A retrospective analysis was performed on referrals as outlined in Table 1. The review period was left open to ensure all referrals on the existing wait list were reviewed. Referrals for patients over the age of 18, and patients not under institutional or correctional care were included. The following referrals were excluded: (1) current or returning patients at all public hospital ophthalmology clinics within the same local health district (LHD), (2) patients who were found to already have a booked future appointment at the POWH Eye Clinic, which arose from referrals not being removed from the wait list for an appointment, (3) patients where the referral was inaccessible, and (4) the patient was deceased since being referred. Referrals were only excluded once all referrals in Set A were collated, and this was performed immediately prior to the commencement of data analysis. Data analysis for Set A commenced on the 10th of August 2017, which was two weeks after the date for which referrals for Set A were drawn. The resultant set of referrals represented new patients who were on the existing non-urgent clinical appointment wait list.

Set B: New Incoming Referrals

Since Set A referrals were only representative of non-urgent referrals received by the POWH Eye Clinic, urgent referrals to the clinic were not captured in the retrospective analysis. Hence, a prospective analysis was also performed on referrals as outlined in Table 1. The analysis was conducted for referrals dated between the 26th of September 2017 and 27th of

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August 2018. The same inclusion and exclusion criteria as applied to Set A were used. Since referrals in Set B were prospectively collected, the criteria were applied within one week after the referrals were forwarded to us by the POWH Eye Clinic. Referrals were forwarded by the POWH Eye Clinic within one week of the referral being received by the clinic. Hence, the analysis for each referral occurred two weeks after receipt of the referral by the POWH Eye Clinic. The resultant set of referrals represented newly referred patients.

Set C: Multiple Referrals

When patients with multiple referrals were identified from Sets A and B, the initial referral remained in Set A and B for analysis and was included in Set C for sub-analysis. Subsequent referrals for the corresponding patient were excluded from Sets A and B and included in Set C.

Data Extraction and Refinement

For all referral sets, the following data were collected for analysis: patient demographics, referrer profession, primary reason for referral, best reported visual acuity (VA) in the worse eye, signs and/or symptoms, specified urgency by the referrer, referral format used, and triage decision.

The primary reason for referral was categorised by author LM as relating to anterior eye, cataract, general examination, or posterior eye. The first reason listed was categorised if multiple reasons were provided. Referrers were classified by profession. Reporting of an urgency and VA were classified as present or absent. If VA was reported, it was classified

as: better than 6/12, between 6/12 and better than 6/60, or 6/60 and worse. Reporting of

signs/symptoms were categorised as: present, diagnosis reported only, or absent. Referral

format was categorised as handwritten letter, POWH Eye Clinic template, or computer-

generated. Triage decision, which was written on the referral, was grouped by: seen within 1

month, seen within 3-6 months, seen within 6-12 months, general clinic non-urgent, cataract

clinic non-urgent, specific doctor's clinic, or rejected. Referrals that were triaged as seen

within 6-12 months, general clinic non-urgent, or cataract clinic non-urgent were considered

to be non-urgent.[27 28] Referrals that had been triaged to be seen with 3-6 months were defined

as semi-urgent.[27 28] Urgent referrals were defined as those requiring an appointment within 1

month.[27-29]

Statistical Analysis

Statistical analyses were performed with SPSS (version 25, IBM, Armonk, USA) and

Graphpad Prism (version 8, Graphpad, San Diego, USA). Demographic variables analysed

included age, gender, and location of residence (derived from postcode). Referrals were

considered complete in information if primary reason for referral, VA, signs/symptoms, and

reported urgency were all included in the referral. Referrals with missing data were not

excluded as referral completeness was an outcome. One-way analysis of variance was used

to assess significant differences in age. Fisher's exact test was used to ascertain statistical

differences in categorical data, with additional post hoc analyses conducted using the

partitioning method if significant.[30] McNemar's test and marginal homogeneity test were

used to determine whether the amount of content provided in paired referrals in Set C

changed. P values less than 0.05 were considered significant except for when a Bonferroni correction to the significance level (α) was applied for post hoc analyses.

Results

Each set of referrals represented new individual cases to the clinic and encompassed different characteristics (Table 1).

Set A: Existing Wait List Referrals

A total of 1,633 patients were on the wait list to be scheduled for an initial appointment. The following referrals were excluded: 649 (39.7%) were for returning patients awaiting recall, 32 (2.0%) could not be traced, 44 (2.7%) were multiple referrals and put aside for Set C, 474 (29.0%) were for patients with already completed or scheduled appointments, three (0.2%) were for now-deceased patients, and 13 (0.8%) were for patients under guardianship. Subsequently, referrals for 418 new patients were analysed. It was found that these referrals corresponded to a period spanning from the 23rd of January 2016 to the 25th of September 2017.

Set B: New Incoming Referrals

A total of 539 new patient referrals were received during the review period. Of these, 11 referrals were categorised as repeat referrals and were excluded from the original data set and separately analysed to form for Set C. All other referrals met the exclusion criteria resulting in a total of 528 referrals.

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Set C: Multiple Referrals

Forty-nine patients were referred multiple times, with 43 referred twice, five referred three times, and one referred four times. Only second referrals were compared to initial referrals due to the small numbers of third and fourth referrals.

Patient Demographics

The demographics of the patients were similar in all analysed sets of referrals (Table 2). The number of referrals from GPs and optometrists were similar between Sets A and B (P = 0.53). The proportion of patients referred from outside the LHD was also similar (P = 0.20), with 19.0% (179) of all patients residing in another metropolitan LHD.

Quality of Referral Content of Set A and B

Overall, 0.2% (one referral) of Set A referrals and 9.8% (52 referrals, P < 0.001) of Set B referrals had a complete set of information. The information provided in referrals is presented in Table 3. Only the presence of an urgency was significantly different between Set A and Set B (P < 0.001). A reason for referral was provided in all referrals.

Subgroup analyses were subsequently performed and are presented in supplementary materials. Cataract was the main reason for referral for both GPs and optometrists (Supplementary Table 1). Rates of reporting VA were lower for GPs compared to optometrists in both sets (both P < 0.001, α was Bonferroni corrected to 0.017). GPs reported more often on diagnoses over signs/symptoms compared to optometrists in both sets (both P < 0.001, α was Bonferroni corrected to 0.017). Referrals from optometrists that reported both

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signs/symptoms and diagnosis were not significantly different between the two sets. Overall, 90.2% (371 referrals) of referrals from optometrists contained both signs/symptoms and a diagnosis.

Since no statistically significant difference was found for referral format, reporting of VA and signs/symptoms, the data for Sets A and B were pooled for analysis. A sign/symptom or a diagnosis were listed more often in the POWH Eye Clinic template (98.0%) compared to computer-generated referrals (88.3%) (P < 0.001, α was Bonferroni corrected to 0.017, Supplementary Table 2). VA was listed more frequently in the POWH Eye Clinic template compared to computer-generated referrals and handwritten letters (84.9% and 35.9%, P < 0.001; and 57.3%, P < 0.001; Bonferroni corrected α was adjusted to 0.017) and listed more often in handwritten letters over computer-generated referrals (P < 0.001; α was Bonferroni corrected to 0.017).

Triage Outcomes of Referrals

All referrals from Set A were triaged as "general clinic non-urgent" (418 referrals). The triage decisions for Set B Referrals are listed in Table 4. Overall, 56.7% (299 referrals) were triaged to a non-urgent clinic. The presence of an urgency in new incoming referrals resulted in a significant difference in triage decisions (P < 0.001), however, post hoc analyses revealed that there were no significance differences in referrals triaged "within 1 month" compared to those triaged "3-6 months", "6-12 months", "general clinic non-urgent", and "cataract clinic non-urgent" (P > 0.99, P = 0.56, P = 0.005, P = 0.05, respectively, α was Bonferroni corrected to 0.0024). Subgroup analyses indicated that for referrals triaged to a non-urgent category,

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8.4% (25 referrals) did not provide a sign/symptom or diagnosis, and 48.5% (145 referrals) did not provide a VA. For referrals triaged to be seen within one month, 57.5% (46 referrals) did not provide a VA, 30.0% (24 referrals) had vision better than 6/12 (Supplementary Table 3), and 16.3% (13 referrals) did not provide a sign/symptom or diagnosis.

Content of Referrals for Patients Referred Multiple Times

The mean time between first and second referrals was 141 ± 175 days, and 15 (30.6%) second referrals were sent within seven days after the first. The reporting of VA, signs/symptoms, and an urgency did not change between referrals (Table 5). The referrer's profession was different between paired referrals in 51.0% of cases (25 referrals, P < 0.001), although we were unable to discern changes in practitioner within the same profession. The reason for referral changed for 46.9% (23 referrals, P < 0.001) of patients. The triage decision changed in 40.8% (20 referrals, P < 0.001) of cases. Of the patients who were referred for the same reason on the second occasion, 37.2% (16 referrals) were triaged differently.

Discussion

This study found that referrals for new patients reported on an urgency, VA, and signs/symptoms to varying degrees, with little reporting on all three. Wait lists were inflated by referrals for patients with already completed or scheduled appointments, and by repeat referrals. For patients who were referred for a second time, the amount of content in both referrals was similar, but patients were referred for different reasons.

Suboptimal Information Content Affects Triage

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Suboptimal information content can subvert the triage process,[31] and in this study, a minority of referrals were found to be complete in information content. Yet, incomplete referrals are deemed to be acceptable by the ophthalmic nurse to triage. The interpretation of such requires significant experience and/or a level of triage training,[32] where inexperience can lead to a reluctance in rejecting referrals, and thus having to adapt to low information content risks less precise triage and inconsistencies. Thus, it is vital that referrals contain information including VA, signs/symptoms, and urgency. Symptoms indicate the functional impacts of conditions and VA is a fundamental component of the degree of visual impairment thereby dictating referral priority, even with non-urgent cases. For example, VA can decrease by two lines and three letters over a period of 13 months in patients who are wait listed for cataract,[33] and those with worse reported VA are generally prioritised. In the case of urgency, referrers may be unable to triage urgency and expect that the hospital would determine implied referral priority from VA and signs/symptoms. The implementation of referral templates has resulted in good quality referrals in other specialty fields.[34] While the clinic's referral template provided a prompt for VA and signs/symptoms, it was not widely used. Simply informing referrers of hospital wait times for assessment is enough to encourage uptake of referral templates.[35]

Causes of Lengthy Wait Lists

The analysis of the electronic wait list revealed that almost three-quarters of referrals did not require an initial appointment, consequently inflating the wait list. These were referrals where a) the patient was deceased, b) already under the care of the clinic, and c) already allocated an appointment, which were not being withdrawn from the wait list. This indicates a lack of

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a process for referrals to be withdrawn when no longer needed. Consequently, the number of patients on the wait list were inflated by administrative problems in managing appointments when given and in not being notified when the appointment was no longer needed. Improvements in waiting times can be expected from improved administrative processes, or reassessment of referrals on the wait list for appropriateness after an extended period can ameliorate this.[6] Moreover, interim optometric examinations to revise the information provided in referrals and/or possibly determine the need for the hospital visit can also reduce wait lists.

Reasons for referral changed in almost half of patients who were referred for a second time and were received from a different profession in half of the patients. Almost one in three repeat referrals were received a week after the first referral. This could indicate that information in a patient's referral needed revision because of the wait to be seen, or patients themselves seeking a different referring practitioner for another opinion who knowingly or unknowingly refers again. These scenarios highlight a need for improved communication and feedback amongst the patient's relevant health professionals and the POWH Eye Clinic[36] including confirmation of receipt of referrals, an indication of wait times, efforts to reduce unnecessary repeat referrals, and in some cases alternative assessments with an optometrist, to better target the provision of service and at the same time decrease wait time.

A proportion of patients referred to the POWH Eye clinic resided outside of its respective LHD. Each metropolitan LHD within New South Wales, Australia is serviced by at least one of ten Tier 2 adult outpatient ophthalmology clinics located within Sydney. The POWH Eye

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Clinic is one of three clinics that does not actively discourage referrals for patients residing outside of its respective LHD, but recommends the use of similar services within a patient's respective LHD.[37] The intake of out-of-area patients can add to wait lists for an appointment, however, this could be a flow-on effect from wait lists in other LHDs.[8] We were unable to determine how many patients sought care simultaneously in multiple LHDs, who then accept the first appointment they are offered, while not necessarily cancelling their request at other LHDs.

Strengths and Limitations

A strength of this study was that it included all referrals of new patients to the POWH Eye Clinic, regardless of the primary reason for which they were referred. Other studies examining wait lists have typically examined referrals to eye clinics for a single condition,[7] [8 38-40] thereby neglecting referrals for other ocular conditions which would also add to the wait lists for referral-only eye clinics. Furthermore, this study examined the backlog of existing referrals for new patients already placed on the wait list, which only contained non-urgent referrals, as well as new incoming referrals for new patients, which included urgent and non-urgent referrals. By doing so, we were able to assess whether the information content of referrals differed between these two sets of referrals. Moreover, we could also track the number of new patients for whom multiple referrals had been received over the review period.

There are several limitations to this study. Referrals in Set A, by design, were heavily biased towards non-urgent referrals, and therefore would not be representative of all referrals

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received by the POWH Eye Clinic. However, this was addressed with the inclusion of referrals in Set B which represented all new incoming referrals and included urgent referrals. Subsequently, there was only a significant difference in referrals reporting on an urgency, which we could conclude was caused by the inclusion of urgent referrals as a part of Set B. At the same time, for Set B, we were unable to ascertain whether all referrals had been forwarded from the POWH Eye Clinic. The reasons for referral were also categorised into four overarching groups, which as a result, may underestimate the number of patients who were referred a second time under a different reason. An overestimation may also have occurred since secondary reasons for referral were not collected during this study and therefore matching reasons may have been missed. In addition to this, the classification of referrers by profession meant that second referrals from a different practitioner within the same profession were not represented in the data. Unlike other studies, this study did not investigate the wait times experienced by new patients,[8 38-40] as these patients did not have an allocated appointment at the time of our referral review. Similarly, as these patients had not been examined by the POWH Eye Clinic, this study was not able to assess the diagnostic accuracy of referrals. Within the context of this study, referral quality was therefore limited to assessing completeness of referral content, even though it could be evaluated through the diagnostic accuracy of referrals.[15 16] Consequently, referrals that are fully completed can still incur inappropriate patient triage if the content of the referral, especially the diagnosis, is insufficient, inaccurate, or incorrect.

Conclusion

In conclusion, referrals to the POWH Eye Clinic were largely incomplete in content leading to triage decisions being made in many cases based on limited clinical information. Referral templates can help prompt for more information being provided and their consistent use can be expected to improve triage. Improved communication amongst the hospital and referrers needs to be addressed to prevent prolonged wait lists. The quantity of referrals on wait lists uncovered by this study justifies the need to develop an integrated care model to cut wait lists. Future work is now underway to determine the effectiveness of alternative models for assessment of patients facing long waits when their complaint is triaged to a non-urgent appointment category.

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Tables

Table 1. Characteristics of the referral sets

	Set A: Existing Wait List Referrals	Set B: New Incoming Referrals	Set C: Multiple Referrals
Inclusion Criterion	Retrospective analysis of referrals received prior to the 26th of September 2017	Prospective analysis of referrals between the 26th of September 2017 and 27th of August 2018	Subset of new patients on the existing wait list or newly referred
Appointment Status	New patients with no appointment scheduled	New patients with newly triaged referrals	New patients referred at least twice
Triage Status	Contains referrals triaged non-urgent only	Referrals triaged urgent and non-urgent	Referrals triaged urgent and non-urgent

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Table 2. Demographics and referrer profession of patients referred to the Prince of Wales Hospital Eye Clinic

	Set A: Existing Wait List Referrals (n = 418)	Set B: New Incoming Referrals (n = 528)	Set C: Multiple Referrals (n = 49)	P value	Post-hoc Analysis[†]
Mean age, y ± SD	65.3 ± 14.5	66.4 ± 15.7	65.9 ± 14.4	0.63	-
Female, n (%)	244 (58.4)	296 (56.1)	29 (59.2)	0.75	-
LHD, n (%)				0.20	-
SESLHD	326 (78.0)	423 (80.9)	41 (83.7)		
Other Metropolitan LHD	89 (21.3)	90 (17.2)	8 (16.3)		
Regional/Rural LHD	3 (0.7)	10 (1.9)	0 (0.0)		
Referrer Profession, n (%)				0.02[‡]	i. vs iii. P = 0.008
i. General practitioner	190 (45.4)	214 (40.5)			
ii. Optometrist	184 (44.0)	227 (43.0)			
iii. Other[§]	44 (10.5)	87 (16.4)			

LHD = Local Heath District; SESLHD = South Eastern Sydney Local Health District

[†] Post hoc α was Bonferroni corrected to 0.017. Only significant P values shown.

[‡] Set C was not included in this analysis as referrer profession may have differed between a patient's first and second referral.

[§] Other included ophthalmologists and intra-hospital referrals.

Table 3. Contents of referrals received by the Prince of Wales Hospital Eye Clinic

	Set A: Existing Wait List Referrals	Set B: New Incoming Referrals	P value
Reason for Referral, n (%)			0.10
Anterior Eye	75 (17.9)	93 (17.6)	
Cataract	201 (48.1)	253 (47.9)	
General Examination	39 (9.3)	55 (10.4)	
Posterior Eye	103 (24.6)	127 (24.1)	
Absent	0 (0.0)	0 (0.0)	
Visual Acuity, n (%)			0.19
Present	191 (45.7)	265 (50.2)	
Absent	227 (54.3)	263 (49.8)	
Signs or Symptoms, n (%)			0.96
Present	271 (64.8)	347 (65.7)	
Diagnosis reported only	109 (26.1)	134 (25.4)	
Absent	38 (9.1)	47 (8.9)	
Urgency, n (%)			< 0.001
Present	11 (2.6)	77 (14.6)	
Absent	407 (97.4)	451 (85.4)	
Referral Format, n (%)			0.28
Handwritten Letter	36 (8.6)	39 (7.4)	
POWH Eye Clinic Template	81 (19.4)	124 (23.5)	
Computer-generated	301 (72.0)	365 (69.1)	

POWH = Prince of Wales Hospital.

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Table 4. Triage decisions of new incoming referrals (Set B) at the Prince of Wales Hospital Eye Clinic and the presence of an urgency in these referrals.

	Urgency Present	Urgency Absent	P Value	Post-hoc Analysis[†]
Triage Decision, n (%)			< 0.001	a. vs f. P < 0.001
a. Within 1 month	20 (25.0)	60 (75.0)		b. vs f. P = 0.002
b. 3-6 months	17 (24.3)	53 (75.7)		
c. 6-12 months	0 (0.0)	4 (100.0)		
d. General Clinic non-urgent	12 (9.5)	114 (90.5)		
e. Cataract Clinic non-urgent	25 (14.5)	148 (85.5)		
f. Specific Doctor's Clinic	3 (4.5)	64 (95.5)		
g. Rejected	0 (0.0)	8 (100.0)		

[†] Post hoc α was Bonferroni corrected to 0.0024. Only significant P values shown.

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Table 5. Referral content between the first and second Referral

	First Referral	Second Referral	P value
Visual Acuity, n (%)			0.19
Present	24 (49.0)	17 (34.7)	
Absent	25 (51.0)	32 (65.3)	
Signs or Symptoms, n (%)			0.07
Present	38 (77.6)	30 (61.2)	
Diagnosis reported only	8 (16.3)	12 (25.4)	
Absent	3 (6.1)	7 (14.3)	
Urgency, n (%)			0.38
Present	2 (4.1)	5 (10.2)	
Absent	47 (95.9)	44 (89.8)	

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Funding

VK is supported by the Australian Government through the Research Training Program (RSAP1000). Guide Dogs NSW/ACT provides support for the Centre for Eye Health, salary support for AL, LM, MK, MY, and BZ, and a top-up scholarship for VK (RSRT6016).

Conflicts of Interests

The authors report no conflicts of interests.

Data Sharing

Summary data sets presented in the publication can be accessed on request. Individual data cannot be shared as per patient confidentiality agreements.

Acknowledgements

The authors would like to acknowledge Zoe Schrire and Sean Sivieng for work pertaining to data acquisition.

Ethics Statement

This study adhered to the Declaration of Helsinki and ethics approval was provided by the Human Research Ethics Committee of the South Eastern Sydney Local Health District (Reference No.: 17/231) and a waiver of consent requirements was provided.

Author Statement

VK was involved in drafting of the manuscript, data analysis, and data interpretation. AL was involved in critical review of the manuscript, data analysis, and data interpretation. LM was involved in critical review of the manuscript, data analysis, and data interpretation. MM was involved in critical review of the manuscript, and data interpretation. MK was involved in critical review of the manuscript, and data interpretation. MY was involved in critical review of the manuscript, and conception. MH was involved in critical review of the manuscript, and conception. BZ was involved in critical review of the manuscript, conception, data analysis, and data interpretation.

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A Review of Referrals Reveal the Impact of Referral Content on the Triage and Management of Ophthalmology Wait Lists

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Supplementary Materials

Supplementary Tables: 3

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Supplementary Table 1. Information content of referrals by profession.

		Reason for Referral					Presence of Visual Acuity			Presence of a Sign or Symptom			
		Anterior Eye	Cataract	General Examination	Posterior Eye	Post hoc Analysis†	Visual Acuity Present	Visual Acuity Absent	Post hoc Analysis†	Sign or Symptoms Present	Diagnosis Reported	Signs or Symptoms Absent	Post hoc Analysis†
Set A: Existing Wait List, n (%)	a. General practitioner	52 (27.4)	62 (32.6)	32 (16.8)	44 (23.2)	a. vs b. P < 0.001	11 (5.8)	179 (94.2)	a. vs b. P < 0.001	81 (42.6)	77 (40.5)	32 (16.8)	a. vs b. P < 0.001
	b. Optometrist	15 (8.2)	124 (67.4)	3 (1.6)	42 (22.8)	b vs c. P < 0.001	168 (91.3)	16 (8.7)		167 (90.8)	15 (8.2)	2 (1.1)	
	c. Other	8 (18.2)	15 (34.1)	4 (9.1)	17 (38.6)		12 (27.3)	32 (72.7)		23 (52.3)	17 (38.6)	4 (9.1)	
Set B: New Incoming Referrals, n (%)	d. General practitioner	53 (24.8)	79 (36.9)	34 (15.9)	48 (22.4)	d. vs e. P < 0.001	21 (9.8)	193 (90.2)	d. vs e. P < 0.001	101 (47.2)	83 (38.8)	30 (14.0)	d. vs e. P < 0.001
	e. Optometrist	25 (11.0)	149 (65.6)	3 (1.3)	50 (22.0)	e. vs f. P < 0.001	212 (93.4)	15 (6.6)		204 (89.9)	22 (9.7)	1 (0.4)	
	f. Other	15 (17.2)	25 (28.7)	18 (20.7)	29 (33.3)		32 (36.8)	55 (63.2)		4 (57.1)	1 (14.3)	2 (28.6)	

†Post hoc α was Bonferroni corrected to 0.017. Only significant post hoc Fisher's exact test P values shown.

Rows may not add up to exactly 100% due to rounding.

Supplementary Table 2. Presence of visual acuity and presence of a sign/symptom or diagnosis based on referral format.

Referral Format, n (%)	Presence of Visual Acuity			Presence of a Sign/Symptom or Diagnosis		
	Present	Absent	Post hoc Analysis[†]	Present	Absent	Post hoc Analysis[†]
a. Computer-generated	239 (35.9)	427 (64.1)	a. vs b. P < 0.001	588 (88.3)	78 (11.7)	a. vs c. P < 0.001
b. Handwritten	43 (57.3)	32 (42.7)	a. vs c. P < 0.001	72 (96.0)	3 (4.0)	
c. POWH Eye Clinic Template	174 (84.9)	31 (15.1)	b. vs c. P < 0.001	201 (98.0)	4 (2.0)	

[†]Post hoc α was Bonferroni corrected to 0.017. Only significant post hoc Fisher's exact test P values shown.

Supplementary Table 3. Triage decision of referrals based on the visual acuity provided.

Triage Decision, n (%)	Better than 6/12	6/12 to better than 6/60	Worse than 6/60	Not Reported
Within 1 month	24 (30.0)	5 (6.3)	5 (6.3)	46 (57.5)
3-6 months	17 (24.3)	22 (31.4)	9 (12.9)	22 (31.4)
6-12 months	0 (0.0)	2 (50.0)	0 (0.0)	2 (50.0)
General Clinic non-urgent	22 (17.5)	17 (13.5)	5 (2.4)	84 (66.7)
Cataract Clinic non-urgent	28 (16.2)	79 (45.7)	5 (2.9)	61 (35.3)
Specific Doctor's Clinic	14 (20.9)	8 (11.9)	4 (6.0)	41 (61.2)
Rejected	0 (0.0)	1 (12.5)	0 (0.0)	7 (87.5)

Rows may not add up to exactly 100% due to rounding.

Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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		Reporting Item	Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	#3	State specific objectives, including any prespecified hypotheses	6
Methods			

Study design	#4	Present key elements of study design early in the paper	7
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7-9
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	7
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	8
Bias	#9	Describe any efforts to address potential sources of bias	8-9
Study size	#10	Explain how the study size was arrived at	9
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	8-9
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	9
Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	9
Statistical methods	#12c	Explain how missing data were addressed	9
Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy	9
Statistical methods	#12e	Describe any sensitivity analyses	N/A

Results

Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	9
Participants	#13b	Give reasons for non-participation at each stage	N/A
Participants	#13c	Consider use of a flow diagram	N/A
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	10, 22
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	24
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-12
Main results	#16b	Report category boundaries when continuous variables were categorized	9-12
Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	9-12

Discussion

Key results	#18	Summarise key results with reference to study objectives	12
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	15

| Interpretation | #20 | Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence. | 12-15 |
| Generalisability | #21 | Discuss the generalisability (external validity) of the study results | 16 |

Other Information

| Funding | #22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | 27 |

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A Review of Referrals Reveal the Impact of Referral Content on the Triage and Management of Ophthalmology Wait Lists

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-047246.R3
Article Type:	Original research
Date Submitted by the Author:	25-Aug-2021
Complete List of Authors:	Khou, Vincent; Centre for Eye Health; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health Ly, Angelica; Centre for Eye Health; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health Moore, Lindsay; Centre for Eye Health; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health Markoulli, Maria ; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health Kalloniatis, Michael; Centre for Eye Health; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health Yapp, Michael; Centre for Eye Health; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health Hennessy, Michael; Centre for Eye Health; Prince of Wales Hospital and Community Health Services, Department of Ophthalmology Zangerl, Barbara; University of New South Wales, School of Optometry and Vision Science, Faculty of Medicine and Health
Primary Subject Heading:	Ophthalmology
Secondary Subject Heading:	Public health, Health services research
Keywords:	OPHTHALMOLOGY, PUBLIC HEALTH, Cataract and refractive surgery < OPHTHALMOLOGY, Clinical audit < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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Word Count: 3,673

Tables: 5

Figures: 0

Supplementary Tables: 3

Key Words: ophthalmology, public hospital, referrals, triage, wait lists

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Abstract

Objectives: Many chronic eye conditions are managed within public hospital ophthalmology clinics resulting in encumbered wait lists. Integrated care schemes can increase system capacity. In order to direct implementation of a public hospital-based integrated eye care model, this study aims to evaluate the quality of referrals for new patients through information content, assess triage decisions of newly referred patients, and evaluate the consistency of referral content for new patients referred multiple times.

Design: A retrospective and prospective review of all referral forms for new patients referred to a public hospital ophthalmology clinic between January 2016 and September 2017, and September 2017 and August 2018, respectively.

Setting: A referral-only public hospital ophthalmology clinic in metropolitan Sydney, Australia.

Participants: 418 new patients on existing non-urgent wait lists waiting to be allocated an initial appointment, and 528 patients that were newly referred.

Primary and secondary outcome measures: The primary outcome was the information content of referrals for new patients. The secondary outcomes were triage outcomes for new incoming referrals, and the number of new patients with multiple referrals.

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Results: Of the wait-listed referrals, 0.2% were complete in referral content compared to 9.8% of new incoming referrals (P < 0.001). Of new incoming referrals, 56.7% were triaged to a non-urgent clinic. Multiple referrals were received for 49 patients, with no change in the amount of referral content.

Conclusions: Most referrals were incomplete in content, leading to triage based on limited clinical information. Some new patients were referred multiple times with their second referral containing a similar amount of content as their first. Lengthy wait lists could be prevented by improving administrative processes and communication between the referral centre and referrers. The future implementation of an integrated eye care model at the study setting could sustainably cut wait lists for patients with chronic eye conditions.

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Article Summary

Strengths and Limitations of this Study

Strengths

- This study reviewed all referrals for new patients to a public hospital eye clinic, regardless of the ocular condition for which they were referred. A condition of inclusion was that an initial appointment had not yet been made.

- This study was also able to identify the number of patients who had been referred to a public hospital eye clinic multiple times but were yet to receive an initial appointment at the clinic.

Limitations

- This study did not measure the wait time between the receipt of referral and date of the patient's initial appointment as an outcome.

- As reasons for referral were categorised within four groups, the number of patients referred for a second time may have been underestimated.

- The categorisation of referrers by their profession meant that repeat referrals from another practitioner within the same profession were not captured in the data.

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Introduction

Increasing life expectancy and declining fertility rates worldwide have resulted in an ageing population.[1] Concurrently, contemporary lifestyle choices have contributed to the prevalence of chronic health conditions in the elderly.[2] This includes chronic, progressive eye disorders which are increasingly prevalent with age.[3] These disorders typically require periodic follow-up to re-assess risk status, establish diagnosis, manage progression, and prevent potential complications,[4] creating a burden on health care systems.

Many chronic eye conditions are managed within public hospital outpatient and inpatient settings. Consequently, wait lists for clinic visits are an ongoing challenge in publicly-funded healthcare systems.[5-7] Increasing demands on public healthcare systems can reduce capacity for new patient intake, which, if not managed, impedes timely and appropriate access to services. For example, patients referred for cataract surgery compete for limited capacity, resulting in waits of over a year for an initial public hospital outpatient clinic assessment,[8] prior to then being placed on the elective surgery wait list.

Several models for the care and management of chronic eye disorders have been examined using referral refinement and/or collaborative care schemes[5] [9-13] and have been shown to increase system capacity.[13] In order to inform future implementation of a novel hospital-based integrated care model that sustainably reduces wait lists, an assessment of wait-listed referrals is required.[14]

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Research regarding referral quality has generally explored the appropriateness of referrals to specialists by examining the diagnostic accuracy of referrals as well as interventions to improve referral appropriateness.[10 15-19] Referral quality has also been assessed through the completeness of referral content.[19-23] It is important to recognise that not all the information on referrals may be required for triage. For example, referrals providing either a presumed diagnosis or observed signs or symptoms may be sufficient for appropriate triage. Notwithstanding, all information provided in a referral could be insufficient for triage if the information is incorrect. Hence, diagnostic accuracy and completeness of referral content both affect the appropriate triage of patients. In particular, the improper categorisation of high-risk patients as non-urgent and vice versa, delays appropriate patient management, resulting in poorer outcomes.[24] Additionally, patients who are referred with incomplete referrals can experience longer wait times than those referred with more complete referrals as they may be perceived as less urgent.[25] Lengthy wait lists can also cause the content of interminably queued referrals to become outdated.[6] Referral quality may differ depending on the referrer's profession[8] and referral format,[26] and standardised referral templates can mitigate such issues.[6]

This study aims to scrutinise wait-listed referrals at a metropolitan public eye clinic by determining the quality of referrals for new patients, assess triage decisions, and evaluate the consistency of referrals for new patients referred multiple times.

Methods

Ethics Approval

This study adhered to the Declaration of Helsinki and ethics approval was provided by the Human Research Ethics Committee of the South Eastern Sydney Local Health District (Reference No.: 17/231) and a waiver of consent requirements was provided.

Patient and Public Involvement

Patients and the public were not involved in the design and conduct of this study.

Prince of Wales Hospital Eye Clinic Triage Protocol and Appointment Process

Referrals at the Prince of Wales Hospital (POWH) Eye Clinic are currently triaged by an on-site ophthalmic nurse. Referrals reporting acute changes such as loss of vision, and red or painful eye; or indicating sight- or life-threatening conditions, such as retinal detachment, orbital cellulitis, or giant cell arteritis, are triaged as requiring urgent attention. If the referral is classified as non-urgent, the patient is placed on a non-urgent wait list. Otherwise, the patient is booked in for an appointment within a six-month time frame. Wait lists for new patients are managed separately from returning patients. Returning patients are independently contacted and scheduled for the appropriate follow-up visits, which are prioritised over initial, non-urgent appointments for new patients.

Study Design

For the study, referrals were evaluated from three different scenarios: existing wait list referrals (Set A), new incoming referrals (Set B), and patients with multiple referrals (Set C). Set A was drawn from the list of outstanding referrals that remained on the wait list for an appointment for new patients as of the 26th of September 2017. Set B was drawn from all

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referrals received for new patients from the 26th of September 2017 until the 27th of August 2018.

Set A: Existing Wait List Referrals

A retrospective analysis was performed on referrals as outlined in Table 1. The review period was left open to ensure all referrals on the existing wait list were reviewed. Referrals for patients over the age of 18, and patients not under institutional or correctional care were included. The following referrals were excluded: (1) current or returning patients at all public hospital ophthalmology clinics within the same local health district (LHD), (2) patients who were found to already have a booked future appointment at the POWH Eye Clinic, which arose from referrals not being removed from the wait list for an appointment, (3) patients where the referral was inaccessible, and (4) the patient was deceased since being referred. Referrals were only excluded once all referrals in Set A were collated, and this was performed immediately prior to the commencement of data analysis. Data analysis for Set A commenced on the 10th of August 2017, which was two weeks after the date for which referrals for Set A were drawn. The resultant set of referrals represented new patients who were on the existing non-urgent clinical appointment wait list.

Set B: New Incoming Referrals

Since Set A referrals were only representative of non-urgent referrals received by the POWH Eye Clinic, urgent referrals to the clinic were not captured in the retrospective analysis. Hence, a prospective analysis was also performed on referrals as outlined in Table 1. The analysis was conducted for referrals dated between the 26th of September 2017 and 27th of

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August 2018. The same inclusion and exclusion criteria as applied to Set A were used. Since referrals in Set B were prospectively collected, the criteria were applied within one week after the referrals were forwarded to us by the POWH Eye Clinic. Referrals were forwarded by the POWH Eye Clinic within one week of the referral being received by the clinic. Hence, the analysis for each referral occurred two weeks after receipt of the referral by the POWH Eye Clinic. The resultant set of referrals represented newly referred patients.

Set C: Multiple Referrals

When patients with multiple referrals were identified from Sets A and B, the initial referral remained in Set A and B for analysis and was included in Set C for sub-analysis. Subsequent referrals for the corresponding patient were excluded from Sets A and B and included in Set C.

Data Extraction and Refinement

For all referral sets, the following data were collected for analysis: patient demographics, referrer profession, primary reason for referral, best reported visual acuity (VA) in the worse eye, signs and/or symptoms, specified urgency by the referrer, referral format used, and triage decision.

The primary reason for referral was categorised by author LM as relating to anterior eye, cataract, general examination, or posterior eye. The first reason listed was categorised if multiple reasons were provided. Referrers were classified by profession. Reporting of an urgency and VA were classified as present or absent. If VA was reported, it was classified

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as: better than 6/12, between 6/12 and better than 6/60, or 6/60 and worse. Reporting of signs/symptoms were categorised as: present, diagnosis reported only, or absent. Referral format was categorised as handwritten letter, POWH Eye Clinic template, or computer-generated. Triage decision, which was written on the referral, was grouped by: seen within 1 month, seen within 3-6 months, seen within 6-12 months, general clinic non-urgent, cataract clinic non-urgent, specific doctor's clinic, or rejected. Referrals that were triaged as seen within 6-12 months, general clinic non-urgent, or cataract clinic non-urgent were considered to be non-urgent.[27 28] Referrals that had been triaged to be seen with 3-6 months were defined as semi-urgent.[27 28] Urgent referrals were defined as those requiring an appointment within 1 month.[27-29]

Statistical Analysis

Statistical analyses were performed with SPSS (version 25, IBM, Armonk, USA) and Graphpad Prism (version 8, Graphpad, San Diego, USA). Demographic variables analysed included age, gender, and location of residence (derived from postcode). Referrals were considered complete in information if primary reason for referral, VA, signs/symptoms, and reported urgency were all included in the referral. Referrals with missing data were not excluded as referral completeness was an outcome. One-way analysis of variance was used to assess significant differences in age. Fisher's exact test was used to ascertain statistical differences in categorical data, with additional post hoc analyses conducted using the partitioning method if significant.[30] McNemar's test and marginal homogeneity test were used to determine whether the amount of content provided in paired referrals in Set C

changed. P values less than 0.05 were considered significant except for when a Bonferroni correction to the significance level (α) was applied for post hoc analyses.

Results

Each set of referrals represented new individual cases to the clinic and encompassed different characteristics (Table 1).

Set A: Existing Wait List Referrals

A total of 1,633 patients were on the wait list to be scheduled for an initial appointment. The following referrals were excluded: 649 (39.7%) were for returning patients awaiting recall, 32 (2.0%) could not be traced, 44 (2.7%) were multiple referrals and put aside for Set C, 474 (29.0%) were for patients with already completed or scheduled appointments, three (0.2%) were for now-deceased patients, and 13 (0.8%) were for patients under guardianship. Subsequently, referrals for 418 new patients were analysed. It was found that these referrals corresponded to a period spanning from the 23rd of January 2016 to the 25th of September 2017.

Set B: New Incoming Referrals

A total of 539 new patient referrals were received during the review period. Of these, 11 referrals were categorised as repeat referrals and were excluded from the original data set and separately analysed to form for Set C. All other referrals met the exclusion criteria resulting in a total of 528 referrals.

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Set C: Multiple Referrals

Forty-nine patients were referred multiple times, with 43 referred twice, five referred three times, and one referred four times. Only second referrals were compared to initial referrals due to the small numbers of third and fourth referrals.

Patient Demographics

The demographics of the patients were similar in all analysed sets of referrals (Table 2). The number of referrals from GPs and optometrists were similar between Sets A and B (P = 0.53). The proportion of patients referred from outside the LHD was also similar (P = 0.10), with 19.0% (179) of all patients residing in another metropolitan LHD.

Quality of Referral Content of Set A and B

Overall, 0.2% (one referral) of Set A referrals and 9.8% (52 referrals, P < 0.001) of Set B referrals had a complete set of information. The information provided in referrals is presented in Table 3. Only the presence of an urgency was significantly different between Set A and Set B (P < 0.001). A reason for referral was provided in all referrals.

Subgroup analyses were subsequently performed and are presented in supplementary materials. Cataract was the main reason for referral for both GPs and optometrists (Supplementary Table 1). Rates of reporting VA were lower for GPs compared to optometrists in both sets (both P < 0.001, α was Bonferroni corrected to 0.017). GPs reported more often on diagnoses over signs/symptoms compared to optometrists in both sets (both P < 0.001, α was Bonferroni corrected to 0.017). Referrals from optometrists that reported both

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signs/symptoms and diagnosis were not significantly different between the two sets. Overall, 90.2% (371 referrals) of referrals from optometrists contained both signs/symptoms and a diagnosis.

Since no statistically significant difference was found for referral format, reporting of VA and signs/symptoms, the data for Sets A and B were pooled for analysis. A sign/symptom or a diagnosis were listed more often in the POWH Eye Clinic template (98.0%) compared to computer-generated referrals (88.3%) (P < 0.001, α was Bonferroni corrected to 0.017, Supplementary Table 2). VA was listed more frequently in the POWH Eye Clinic template compared to computer-generated referrals and handwritten letters (84.9% and 35.9%, P < 0.001; and 57.3%, P < 0.001; Bonferroni corrected α was adjusted to 0.017) and listed more often in handwritten letters over computer-generated referrals (P < 0.001; α was Bonferroni corrected to 0.017).

Triage Outcomes of Referrals

All referrals from Set A were triaged as "general clinic non-urgent" (418 referrals). The triage decisions for Set B Referrals are listed in Table 4. Overall, 56.7% (299 referrals) were triaged to a non-urgent clinic. The presence of an urgency in new incoming referrals resulted in a significant difference in triage decisions (P < 0.001), however, post hoc analyses revealed that there were no significance differences in referrals triaged "within 1 month" compared to those triaged "3-6 months", "6-12 months", "general clinic non-urgent", and "cataract clinic non-urgent" (P > 0.99, P = 0.56, P = 0.005, P = 0.05, respectively, α was Bonferroni corrected to 0.0024). Subgroup analyses indicated that for referrals triaged to a non-urgent category,

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8.4% (25 referrals) did not provide a sign/symptom or diagnosis, and 48.5% (145 referrals)

did not provide a VA. For referrals triaged to be seen within one month, 57.5% (46 referrals)

did not provide a VA, 30.0% (24 referrals) had vision better than 6/12 (Supplementary Table

3), and 16.3% (13 referrals) did not provide a sign/symptom or diagnosis.

Content of Referrals for Patients Referred Multiple Times

The mean time between first and second referrals was 141 ± 175 days, and 15 (30.6%) second

referrals were sent within seven days after the first. The reporting of VA, signs/symptoms,

and an urgency did not change between referrals (Table 5). The referrer's profession was

different between paired referrals in 51.0% of cases (25 referrals, P < 0.001), although we

were unable to discern changes in practitioner within the same profession. The reason for

referral changed for 46.9% (23 referrals, P < 0.001) of patients. The triage decision changed

in 40.8% (20 referrals, P < 0.001) of cases. Of the patients who were referred for the same

reason on the second occasion, 37.2% (16 referrals) were triaged differently.

Discussion

This study found that referrals for new patients reported on an urgency, VA, and

signs/symptoms to varying degrees, with little reporting on all three. Wait lists were inflated

by referrals for patients with already completed or scheduled appointments, and by repeat

referrals. For patients who were referred for a second time, the amount of content in both

referrals was similar, but patients were referred for different reasons.

Suboptimal Information Content Affects Triage

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Suboptimal information content can subvert the triage process,[31] and in this study, a minority of referrals were found to be complete in information content. Yet, incomplete referrals are deemed to be acceptable by the ophthalmic nurse to triage. The interpretation of such requires significant experience and/or a level of triage training,[32] where inexperience can lead to a reluctance in rejecting referrals, and thus having to adapt to low information content risks less precise triage and inconsistencies. Thus, it is vital that referrals contain information including VA, signs/symptoms, and urgency. Symptoms indicate the functional impacts of conditions and VA is a fundamental component of the degree of visual impairment thereby dictating referral priority, even with non-urgent cases. For example, VA can decrease by two lines and three letters over a period of 13 months in patients who are wait listed for cataract,[33] and those with worse reported VA are generally prioritised. In the case of urgency, referrers may be unable to triage urgency and expect that the hospital would determine implied referral priority from VA and signs/symptoms. The implementation of referral templates has resulted in good quality referrals in other specialty fields.[34] While the clinic's referral template provided a prompt for VA and signs/symptoms, it was not widely used. Simply informing referrers of hospital wait times for assessment is enough to encourage uptake of referral templates.[35]

Causes of Lengthy Wait Lists

The analysis of the electronic wait list revealed that almost three-quarters of referrals did not require an initial appointment, consequently inflating the wait list. These were referrals where a) the patient was deceased, b) already under the care of the clinic, and c) already allocated an appointment, which were not being withdrawn from the wait list. This indicates a lack of

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a process for referrals to be withdrawn when no longer needed. Consequently, the number of patients on the wait list were inflated by administrative problems in managing appointments when given and in not being notified when the appointment was no longer needed. Improvements in waiting times can be expected from improved administrative processes, or reassessment of referrals on the wait list for appropriateness after an extended period can ameliorate this.[6] Moreover, interim optometric examinations to revise the information provided in referrals and/or possibly determine the need for the hospital visit can also reduce wait lists.

Reasons for referral changed in almost half of patients who were referred for a second time and were received from a different profession in half of the patients. Almost one in three repeat referrals were received a week after the first referral. This could indicate that information in a patient's referral needed revision because of the wait to be seen, or patients themselves seeking a different referring practitioner for another opinion who knowingly or unknowingly refers again. These scenarios highlight a need for improved communication and feedback amongst the patient's relevant health professionals and the POWH Eye Clinic[36] including confirmation of receipt of referrals, an indication of wait times, efforts to reduce unnecessary repeat referrals, and in some cases alternative assessments with an optometrist, to better target the provision of service and at the same time decrease wait time.

A proportion of patients referred to the POWH Eye clinic resided outside of its respective LHD. Each metropolitan LHD within New South Wales, Australia is serviced by at least one of ten Tier 2 adult outpatient ophthalmology clinics located within Sydney. The POWH Eye

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Clinic is one of three clinics that does not actively discourage referrals for patients residing outside of its respective LHD, but recommends the use of similar services within a patient's respective LHD.[37] The intake of out-of-area patients can add to wait lists for an appointment, however, this could be a flow-on effect from wait lists in other LHDs.[8] We were unable to determine how many patients sought care simultaneously in multiple LHDs, who then accept the first appointment they are offered, while not necessarily cancelling their request at other LHDs.

Strengths and Limitations

A strength of this study was that it included all referrals of new patients to the POWH Eye Clinic, regardless of the primary reason for which they were referred. Other studies examining wait lists have typically examined referrals to eye clinics for a single condition,[7] [8 38-40] thereby neglecting referrals for other ocular conditions which would also add to the wait lists for referral-only eye clinics. Furthermore, this study examined the backlog of existing referrals for new patients already placed on the wait list, which only contained non-urgent referrals, as well as new incoming referrals for new patients, which included urgent and non-urgent referrals. By doing so, we were able to assess whether the information content of referrals differed between these two sets of referrals. Moreover, we could also track the number of new patients for whom multiple referrals had been received over the review period.

There are several limitations to this study. Referrals in Set A, by design, were heavily biased towards non-urgent referrals, and therefore would not be representative of all referrals

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received by the POWH Eye Clinic. However, this was addressed with the inclusion of referrals in Set B which represented all new incoming referrals and included urgent referrals. Subsequently, there was only a significant difference in referrals reporting on an urgency, which we could conclude was caused by the inclusion of urgent referrals as a part of Set B. At the same time, for Set B, we were unable to ascertain whether all referrals had been forwarded from the POWH Eye Clinic. The reasons for referral were also categorised into four overarching groups, which as a result, may underestimate the number of patients who were referred a second time under a different reason. An overestimation may also have occurred since secondary reasons for referral were not collected during this study and therefore matching reasons may have been missed. In addition to this, the classification of referrers by profession meant that second referrals from a different practitioner within the same profession were not represented in the data. Unlike other studies, this study did not investigate the wait times experienced by new patients,[8][38-40] as these patients did not have an allocated appointment at the time of our referral review. Similarly, as these patients had not been examined by the POWH Eye Clinic, this study was not able to assess the diagnostic accuracy of referrals. Within the context of this study, referral quality was therefore limited to assessing completeness of referral content, even though it could be evaluated through the diagnostic accuracy of referrals.[15][16] Consequently, referrals that are fully completed can still incur inappropriate patient triage if the content of the referral, especially the diagnosis, is insufficient, inaccurate, or incorrect.

Conclusion

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In conclusion, referrals to the POWH Eye Clinic were largely incomplete in content leading to triage decisions being made in many cases based on limited clinical information. Referral templates can help prompt for more information being provided and their consistent use can be expected to improve triage. Improved communication amongst the hospital and referrers needs to be addressed to prevent prolonged wait lists. The quantity of referrals on wait lists uncovered by this study justifies the need to develop an integrated care model to cut wait lists. Future work is now underway to determine the effectiveness of alternative models for assessment of patients facing long waits when their complaint is triaged to a non-urgent appointment category.

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Tables

Table 1. Characteristics of the referral sets

	Set A: Existing Wait List Referrals	Set B: New Incoming Referrals	Set C: Multiple Referrals
Inclusion Criterion	Retrospective analysis of referrals received prior to the 26th of September 2017	Prospective analysis of referrals between the 26th of September 2017 and 27th of August 2018	Subset of new patients on the existing wait list or newly referred
Appointment Status	New patients with no appointment scheduled	New patients with newly triaged referrals	New patients referred at least twice
Triage Status	Contains referrals triaged non-urgent only	Referrals triaged urgent and non-urgent	Referrals triaged urgent and non-urgent

Table 2. Demographics and referrer profession of patients referred to the Prince of Wales Hospital Eye Clinic

	Set A: Existing Wait List Referrals (n = 418)	Set B: New Incoming Referrals (n = 528)	P value	Post-hoc Analysis[†]
Mean age, y (SD)	65.3 (14.5)	66.3 (15.7)	0.33	-
Female, n (%)	244 (58.4)	296 (56.1)	0.51	-
LHD, n (%)			0.10	-
SESLHD	326 (78.0)	423 (80.9)		
Other Metropolitan LHD	89 (21.3)	90 (17.2)		
Regional/Rural LHD	3 (0.7)	10 (1.9)		
Referrer Profession, n (%)			0.02	i. vs iii. P = 0.008
i. General practitioner	190 (45.4)	214 (40.5)		
ii. Optometrist	184 (44.0)	227 (43.0)		
iii. Other[‡]	44 (10.5)	87 (16.4)		

LHD = Local Heath District; SESLHD = South Eastern Sydney Local Health District

[†] Post hoc α was Bonferroni corrected to 0.017. Only significant P values shown.

[‡] Other included ophthalmologists and intra-hospital referrals.

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Table 3. Contents of referrals received by the Prince of Wales Hospital Eye Clinic

	Set A: Existing Wait List Referrals	Set B: New Incoming Referrals	P value
Reason for Referral, n (%)			0.10
Anterior Eye	75 (17.9)	93 (17.6)	
Cataract	201 (48.1)	253 (47.9)	
General Examination	39 (9.3)	55 (10.4)	
Posterior Eye	103 (24.6)	127 (24.1)	
Absent	0 (0.0)	0 (0.0)	
Visual Acuity, n (%)			0.19
Present	191 (45.7)	265 (50.2)	
Absent	227 (54.3)	263 (49.8)	
Signs or Symptoms, n (%)			0.96
Present	271 (64.8)	347 (65.7)	
Diagnosis reported only	109 (26.1)	134 (25.4)	
Absent	38 (9.1)	47 (8.9)	
Urgency, n (%)			< 0.001
Present	11 (2.6)	77 (14.6)	
Absent	407 (97.4)	451 (85.4)	
Referral Format, n (%)			0.28
Handwritten Letter	36 (8.6)	39 (7.4)	
POWH Eye Clinic Template	81 (19.4)	124 (23.5)	
Computer-generated	301 (72.0)	365 (69.1)	

POWH = Prince of Wales Hospital.

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Table 4. Triage decisions of new incoming referrals (Set B) at the Prince of Wales Hospital Eye Clinic and the presence of an urgency in these referrals.

	Urgency Present	Urgency Absent	P value	Post-hoc Analysis[†]
Triage Decision, n (%)			< 0.001	a. vs b. P > 0.99
a. Within 1 month	20 (25.0)	60 (75.0)		a. vs c. P = 0.56
b. 3-6 months	17 (24.3)	53 (75.7)		a. vs d. P = 0.005
c. 6-12 months	0 (0.0)	4 (100.0)		a. vs e. P = 0.05
d. General Clinic non-urgent	12 (9.5)	114 (90.5)		**a. vs f. P < 0.001**
e. Cataract Clinic non-urgent	25 (14.5)	148 (85.5)		**b. vs f. P = 0.002**
f. Specific Doctor's Clinic	3 (4.5)	64 (95.5)		
g. Rejected	0 (0.0)	8 (100.0)		

[†]Post hoc α was Bonferroni corrected to 0.0024. Only significant P values and select non-significant P values shown. Significant P values are in **bold**.

Table 5. Referral content between the first and second Referral

	First Referral	Second Referral	P value
Visual Acuity, n (%)			0.19
Present	24 (49.0)	17 (34.7)	
Absent	25 (51.0)	32 (65.3)	
Signs or Symptoms, n (%)			0.07
Present	38 (77.6)	30 (61.2)	
Diagnosis reported only	8 (16.3)	12 (25.4)	
Absent	3 (6.1)	7 (14.3)	
Urgency, n (%)			0.38
Present	2 (4.1)	5 (10.2)	
Absent	47 (95.9)	44 (89.8)	

Funding

Conflicts of Interests

The authors report no conflicts of interests.

Data Sharing

Summary data sets presented in the publication can be accessed on request. Individual data cannot be shared as per patient confidentiality agreements.

Acknowledgements

Ethics Statement

This study adhered to the Declaration of Helsinki and ethics approval was provided by the Human Research Ethics Committee of the South Eastern Sydney Local Health District (Reference No.: 17/231) and a waiver of consent requirements was provided.

Author Statement

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VK was involved in drafting of the manuscript, data analysis, and data interpretation. AL was involved in critical review of the manuscript, data analysis, and data interpretation. LM was involved in critical review of the manuscript, data analysis, and data interpretation. MM was involved in critical review of the manuscript, and data interpretation. MK was involved in critical review of the manuscript, and data interpretation. MY was involved in critical review of the manuscript, and conception. MH was involved in critical review of the manuscript, and conception. BZ was involved in critical review of the manuscript, conception, data analysis, and data interpretation.

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A Review of Referrals Reveal the Impact of Referral Content on the Triage and Management of Ophthalmology Wait Lists

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Supplementary Materials

Supplementary Tables: 3

Supplementary Table 1. Information content of referrals by profession.

		Reason for Referral					Presence of Visual Acuity			Presence of a Sign or Symptom			
		Anterior Eye	Cataract	General Examination	Posterior Eye	Post hoc Analysis[†]	Visual Acuity Present	Visual Acuity Absent	Post hoc Analysis[†]	Sign or Symptoms Present	Diagnosis Reported	Signs or Symptoms Absent	Post hoc Analysis[†]
Set A: Existing Wait List, n (%)	a. General practitioner	52 (27.4)	62 (32.6)	32 (16.8)	44 (23.2)	a. vs b. $P < 0.001$	11 (5.8)	179 (94.2)	a. vs b. $P < 0.001$	81 (42.6)	77 (40.5)	32 (16.8)	a. vs b. $P < 0.001$
	b. Optometrist	15 (8.2)	124 (67.4)	3 (1.6)	42 (22.8)	b vs c. $P < 0.001$	168 (91.3)	16 (8.7)		167 (90.8)	15 (8.2)	2 (1.1)	
	c. Other	8 (18.2)	15 (34.1)	4 (9.1)	17 (38.6)		12 (27.3)	32 (72.7)		23 (52.3)	17 (38.6)	4 (9.1)	
Set B: New Incoming Referrals, n (%)	d. General practitioner	53 (24.8)	79 (36.9)	34 (15.9)	48 (22.4)	d. vs e. $P < 0.001$	21 (9.8)	193 (90.2)	d. vs e. $P < 0.001$	101 (47.2)	83 (38.8)	30 (14.0)	d. vs e. $P < 0.001$
	e. Optometrist	25 (11.0)	149 (65.6)	3 (1.3)	50 (22.0)	e. vs f. $P < 0.001$	212 (93.4)	15 (6.6)		204 (89.9)	22 (9.7)	1 (0.4)	
	f. Other	15 (17.2)	25 (28.7)	18 (20.7)	29 (33.3)		32 (36.8)	55 (63.2)		4 (57.1)	1 (14.3)	2 (28.6)	

[†]Post hoc α was Bonferroni corrected to 0.017. Only significant post hoc Fisher's exact test P values shown.

Rows may not add up to exactly 100% due to rounding.

Supplementary Table 2. Presence of visual acuity and presence of a sign/symptom or diagnosis based on referral format.

Referral Format, n (%)	Presence of Visual Acuity			Presence of a Sign/Symptom or Diagnosis		
	Present	Absent	Post hoc Analysis[†]	Present	Absent	Post hoc Analysis[†]
a. Computer-generated	239 (35.9)	427 (64.1)	a. vs b. P < 0.001	588 (88.3)	78 (11.7)	a. vs c. P < 0.001
b. Handwritten	43 (57.3)	32 (42.7)	a. vs c. P < 0.001	72 (96.0)	3 (4.0)	
c. POWH Eye Clinic Template	174 (84.9)	31 (15.1)	b. vs c. P < 0.001	201 (98.0)	4 (2.0)	

[†]Post hoc α was Bonferroni corrected to 0.017. Only significant post hoc Fisher's exact test P values shown.

Supplementary Table 3. Triage decision of referrals based on the visual acuity provided.

Triage Decision, n (%)	Better than 6/12	6/12 to better than 6/60	Worse than 6/60	Not Reported
Within 1 month	24 (30.0)	5 (6.3)	5 (6.3)	46 (57.5)
3-6 months	17 (24.3)	22 (31.4)	9 (12.9)	22 (31.4)
6-12 months	0 (0.0)	2 (50.0)	0 (0.0)	2 (50.0)
General Clinic non-urgent	22 (17.5)	17 (13.5)	5 (2.4)	84 (66.7)
Cataract Clinic non-urgent	28 (16.2)	79 (45.7)	5 (2.9)	61 (35.3)
Specific Doctor's Clinic	14 (20.9)	8 (11.9)	4 (6.0)	41 (61.2)
Rejected	0 (0.0)	1 (12.5)	0 (0.0)	7 (87.5)

Rows may not add up to exactly 100% due to rounding.

Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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		Reporting Item	Page Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	#3	State specific objectives, including any prespecified hypotheses	6
Methods			

Study design	#4	Present key elements of study design early in the paper	7	
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7-9	
Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	7	
	#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8	
Data sources / measurement	#8	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	8	
Bias	#9	Describe any efforts to address potential sources of bias	8-9	
Study size	#10	Explain how the study size was arrived at	9	
Quantitative variables	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	8-9	
Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	9	
Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	9	
Statistical methods	#12c	Explain how missing data were addressed	9	
Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy	9	
Statistical methods	#12e	Describe any sensitivity analyses	N/A	

Results

Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	9
Participants	#13b	Give reasons for non-participation at each stage	N/A
Participants	#13c	Consider use of a flow diagram	N/A
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	10, 22
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	24
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-12
Main results	#16b	Report category boundaries when continuous variables were categorized	9-12
Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	9-12

Discussion

Key results	#18	Summarise key results with reference to study objectives	12
Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	15

Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	12-15
Generalisability	#21	Discuss the generalisability (external validity) of the study results	16

Other Information

Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	27

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