

# Recommendations for an improved referral system for specialized glaucoma clinics in Poland

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## HIGHLIGHTS

The paper presents an analysis of referral letters to the Glaucoma Outpatient Clinic, discussing the most important clinical information that should be included.

## ABSTRACT

This study assessed the quality of referral letters to the Glaucoma Outpatient Clinic and patients' first consultation results. A retrospective study included 196 patients newly referred to the clinic. Referrals were mainly issued by ophthalmologists (156; 79.6%). Regarding their urgency level, the planned referrals (184; 93.9%) were dominant. The majority of referral diagnoses (147; 75%) were confirmed as glaucoma in the clinic, whereas 17 (8.2%) glaucoma diagnoses were rejected. 64 (32.7%) patients did not require further ophthalmological review. The assessment of the quality of referral letters revealed that important clinical data was missing. There is a need to improve the referral system to specialist glaucoma clinics in Poland.

**Key words:** glaucoma, resources, referral assessment, tertiary center, healthcare

## INTRODUCTION

Glaucoma is a group of chronic disorders, associated with potentially progressive optic neuropathy and visual field loss. The condition is highly dependent on intraocular pressure (IOP) [1]. Globally in 2010, glaucoma was diagnosed in 64.3 million patients [2]. It is estimated that glaucoma populations will increase significantly in the following years – to approximately 76 million patients in 2020 and 111.8 million in 2040 [2]. In 2015, Polish epidemiological data indicated that the condition affected approximately 420,000 patients [3], with at least the same number undiagnosed [4]. According to Polish clinical practice, since 2015, referral letters from health insurance doctors have been required to register with ophthalmologists. Patients diagnosed with glaucoma may be monitored by local ophthalmologists or referred to specialist glaucoma clinics, with better diagnostic and advanced treatment methods. Currently, a limited number of European studies have investigated outcomes resulting from referrals to glaucoma clinics [5, 6], however none have been performed in a Polish setting.

We assessed the quality of referral letters to the Glaucoma Outpatient Clinic at the University Hospital of Lord's Transfiguration in Poznan, Poland.

## MATERIALS AND METHODS

This was a retrospective analysis of 196 referrals. A group of 196 patients were recruited, newly referred to the Glaucoma Outpatient Clinic between January 1<sup>st</sup>, 2019 and June 30<sup>th</sup>, 2019. We analyzed referral data and patient electronic medical records from their first visit to the clinic.

The following information was extracted: patient name, birth date, sex, referral doctor's specialization, primary diagnosis, degree of urgency and referral reason. Ophthalmologic examination details were then collected, including prior glaucoma diagnosis and duration, other ocular pathologies, family history of glaucoma or other ocular pathologies, ocular surgery, symptoms classified as alarming or disturbing and physical examination details during the first assessment i.e. visual acuity and refraction, disc evaluation as cup to disc ratio (c/d), IOP and angle assessment gonioscopy. A record was made if emergency IOP lowering treatment was administered during the visit i.e. pharmacological, laser treatment – YAG (yttrium aluminum garnet) iridotomy or selective laser trabeculoplasty (SLT). The outcomes of OCT RNFL (optical coherence tomography, retinal nerve fiber layer thickness;  $\mu$ m) and visual fields (as mean defect value, MD; dB) were recorded if available. The following techniques and equipment were used for patient examination: slit lamp (Topcon Corporation, Tokyo, Japan), The AT 900 Goldmann applanation tonometer for IOP assessment (Haag-Streit, Bern, Swiss), gonioscopy with Zeiss 4-mirror gonio lens, optical coherence

tomography with Zeiss Cirrus 4000 HD-OCT (Carl Zeiss Meditec, Jena, Germany), and visual field using a Medmont M700 Automated Perimeter (Medmont International PTY LTD, Nunavading, Victoria, Australia).

In this study, diagnoses made in the Glaucoma Outpatient Clinic were compared with referral diagnoses. Further patients' recommendations were analyzed, including treatment, requirements for ophthalmological review and qualification for antiglaucoma surgery.

The study protocol was approved by the Bioethical Review Board of Poznan University of Medical Sciences.

## RESULTS

We recruited 196 patients; 132 women and 64 men, with a mean age of  $63 \pm 15.99$  years (mean  $\pm$  standard deviation [SD]). Tables 1, 2 and 3 show referral sources, diagnoses, urgency degree and reasons for analyzed referrals.

TABLE 1

Referral sources and diagnoses.

Referral source	Glaucoma n (%)	Suspected glaucoma n (%)	OHT n (%)	Another n (%)
Ophthalmologist	121 (61.7)	32 (16.3)	3 (1.5)	0 (0)
Family doctor	20 (10.2)	10 (5.1)	0 (0)	1 (0.5)
Emergency doctor	5 (2.6)	2 (1)	0 (0)	0 (0)
Another	0 (0)	2 (1)	0 (0)	0 (0)
Total	146 (74.5)	46 (23.5)	3 (1.5)	1 (0.5)

OHT – ocular hypertension.

TABLE 2

Referral sources and urgency levels.

Referral source	Planned n (%)	Urgent n (%)	Emergency n (%)
Ophthalmologist	148 (75.5)	0 (0)	8 (4.1)
Family doctor	31 (15.8)	0 (0)	0 (0)
Emergency doctor	3 (1.5)	4 (2)	0 (0)
Another	1 (0.5)	0 (0)	0 (0)
Total	184 (93.9)	4 (2)	8 (4.1)

TABLE 3

Sources and referral reasons.			
Referral source	Medical consultation n (%)	Ocular surgery n (%)	Both n (%)
Ophthalmologist	105 (53.6)	30 (15.3)	21 (10.7)
Family doctor	24 (12.2)	4 (2)	3 (1.5)
Emergency doctor	5 (2.6)	2 (1)	0 (0)
Another	2 (1)	0 (0)	0 (0)
Total	136 (69.4)	36 (18.4)	24 (12.2)

Patients with prior glaucoma diagnosis (n = 146; 74.5%) declared the length of time they had the disease as ≤ 0.5 year (n = 35; 24%), > 0.5 and ≤ 5 years (n = 56; 38.3%), > 5 and ≤ 10 years (n = 21; 14.3%), > 10 years (n = 24; 16.4%). Ten patients (7%) did not remember when their diagnosis was made.

Then 47 patients (24%) declared a family history of glaucoma, 29 declared other familial ocular pathologies (14.8%) or previous ocular surgeries (n = 65; 33.2%), including cataract surgeries (n = 36; 18.4%), YAG iridotomy (n = 13; 6.6%) or glaucoma-associated surgeries (each < 3%: SLT and ocular cryotherapy).

The majority of patients (n = 130; 66.3%) declared alarming or disturbing symptoms, including decreased visual acuity (Snellen; n = 68; 34.7%), permanent or periodic eye pain (n = 22; 11.2%), blurred vision (n = 12; 6.1%) or other symptoms (each < 5%: subjective restriction of the visual field, halo effect around light sources, photophobia, stains in the visual field, excessive tearing or dry eye). Table 4 summarizes patients' examination outcomes. Figure 1 represents average IOP for both eyes.

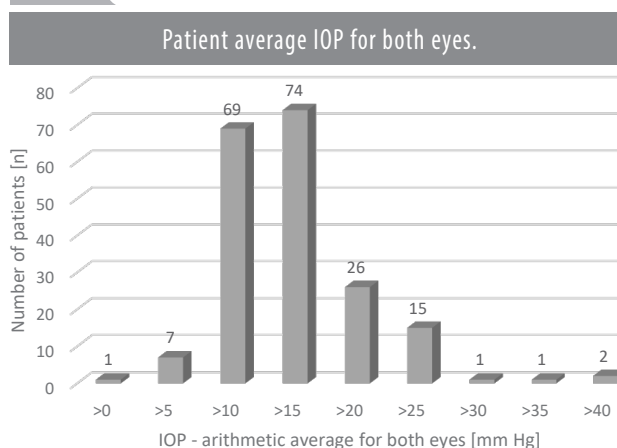
TABLE 4

The examination outcomes for patient left and right eyes.		
	Right eye	Left eye
<b>Visual acuity, Snellen (n)</b>		
Lack of light perception	5	6
Hand motion	2	1
< 0.1	7	6
0.1–0.2	8	10
0.3–0.4	12	8
0.5–0.6	46	50
0.7–0.8	67	68
0.9–1.0	49	47

Intraocular pressure (mmHg)		
Arithmetic average for each eye	17.81	17.67
Minimum value	4	4
Maximum value	62	43
c/d ratio (n)		
c/d < 0.7	112	107
c/d ≥ 0.7	66	67
not determined	18	22
RNFL thickness (n)		
Normal > 80 μm	66	65
Glaucoma suspicion; 70–79 μm	39	34
Glaucoma implied; < 70 μm	52	60
Visual field, MD (n)		
Early damage < -6 dB	84	76
Moderate damage < -12 dB	32	38
Advanced damage > 12 dB	12	11

MD – mean deviation; RNFL – retinal nerve fiber layer.

FIGURE 1



IOP – intraocular pressure.

Emergency IOP lowering treatment were administered to 22 patients (11.2%), including pharmacological (n = 19; 9.7%), interventional (n = 2; 1%), or both (n = 1; 0.5%). Asymmetry in cup to disc ratios between two eyes (≥ 0.2 c/d difference) was observed in 66 cases (33.7%). In some patients, fundus examination was not performed due to narrow angles, keratopathy or mature cataracts, therefore ocular ultrasonography was recommended. In patients with visual field examination performed by the referring doctor, this was not repeated (n = 24; 12.2% for the right eye; n = 24; 12.2% for the left eye). In 44 right eyes and

47 left eyes, visual field examinations were not performed. A glaucoma diagnosis on referral was confirmed in 147 patients (75%), including 10 patients (5.1%) with normal tension glaucoma (NTG). Among these patients, primary glaucoma was diagnosed in 100 patients and secondary glaucoma in 47 patients. Open-angle and angle-closure glaucoma types were determined in 121 and 26 patients, respectively. Ocular hypertension (OHT) was observed in 8 patients (4%). A suspect glaucoma diagnosis was identified in 17 cases (8.7%), including NTG in 2 cases (1%).

Pseudoexfoliation syndrome was the most common reason for secondary glaucoma ( $n = 25$ ; 12.8%), then pigment dispersion syndrome ( $n = 5$ ; 2.6%), cataractous lens ( $n = 3$ ; 1.5%), inflammatory glaucoma ( $n = 3$ ; 1.5%), neovascular glaucoma ( $n = 1$ ; 0.5%), steroid-induced glaucoma ( $n = 1$ ; 0.5%) or undetermined glaucoma ( $n = 8$ ; 4%).

In comparison to referral diagnoses, the clinic confirmed 129 glaucoma diagnoses (88.4% of all patients with a referral glaucoma diagnosis), whereas 17 (8.2%) glaucoma diagnoses made in district ophthalmology clinics were rejected. Specifically, 17 out of 46 (37%) glaucoma suspect patients were diagnosed as glaucoma in the clinic; 8 patients (6.5%) from this group remained with suspect glaucoma and required periodic control. Then, OHT was confirmed in our clinic in 1 from 3 patients referred with OHT diagnosis (33.3%).

Chronic treatment with antiglaucoma eye drops was administered to 157 patients (80.1%), mainly for glaucoma. A minority of patients were diagnosed with OHT or glaucoma suspect. 38 patients (19.4%) were discharged from any treatments, with an average IOP of 16.3 mmHg. Previous treatment was recommended for 49 patients (25%), and treatment dose changes were established for 5 patients (2.6%). Modification of previous treatments were recommended for 83 patients (42.3%). 20 patients, previously untreated, were recommended to initiate IOP lowering treatments. Only 1 patient (0.5%) was discharged from a previous treatment.

To summarize further recommendations, active monitoring was suggested for 132 patients (67.3%) with an average IOP of 18.3 mmHg. 64 (32.7%) patients were discharged from ophthalmological review, with an average IOP of 16.7 mmHg. Further reviews in district ophthalmology clinics were recommended for 116 (59.2%) patients, with IOP monitoring in 161 (82.1%). A recommendation for laser treatment was suggested for 37 patients (18.9%), including YAG iridotomy (19; 9.7%) and SLT (18; 9.2%). A recommendation for ocular surgery was required for 53 patients (27%), including planned (non-urgent) phacoemulsification ( $n = 25$ ; 12.8%) and planned anti-glaucoma surgeries, such as cyclocryotherapy ( $n = 8$ ; 4.1%), trabeculectomy ( $n = 4$ ; 2.0%), phaco-trabeculectomy ( $n = 3$ ; 1.5%) and sclerectomy ( $n = 6$ ; 3.1%). An urgent recommendation for phacoemul-

sification was required for 5 patients (2.6%), and 2 patients (1%) were recommended for urgent phaco-trabeculectomy. Only 2 patients (1%) were discharged from any further ophthalmologic examinations. 7 other patients (3.6%) were advised for visual evoked potential (VEP) and/or electroretinography tests (ERG), and for individual patients, other examinations were advised, including fluorescein angiography ( $n = 1$ ; 0.5%), magnetic resonance imaging (MRI;  $n = 2$ ; 1.0%) or ultrasound biomicroscopy (UBM;  $n = 2$ ; 1.0%).

Laser or surgical glaucoma treatment was given to 20 patients (10.2%) during their first visit to the clinic, including: YAG iridotomy ( $n = 16$ ; 8.2%), SLT ( $n = 2$ ; 1%), urgent phaco-emulsification with release of adhesions in the angle ( $n = 2$ ; 1%) and YAG capsulotomy ( $n = 1$ ; 0.5%).

## DISCUSSION

Glaucoma is a chronic disease leading to irreversible consequences, including progressive restriction of visual fields and blindness. Glaucoma-associated blindness is prevalent in approximately 2 million patients worldwide [5]. Cost-effective diagnostics for particular glaucoma patients could decrease number of complication. In Poland, the referral system is a primary component of this process, allowing patients to qualify to appropriate levels of healthcare.

In terms of referral systems to specialist clinics, Cheng et al. [6] presented survey data from glaucoma specialists who determined a clinical checklist for referring physicians. The most important referral information was maximum and current IOP, disc evaluation, serial visual test examinations and serial disc imaging. In our study, referral letters to our clinic did not contain any of these elements. We only ascertained basic demographic and nonclinical information (referrer's data, degree of urgency), with a primary diagnosis or short request to the glaucoma specialist. There was no information of glaucoma duration, previous treatment, drug allergies or ocular surgeries. The only source of information was the patient, however patients usually had no documents confirming dates and procedures. In fact, patients did not remember important clinical information, such as medicines they were taking, thus major clinical data was missing. Another serious disadvantage of the current referral letter system was a lack of clinical findings from previous examinations. District ophthalmologists performed necessary examinations, what revealed patients' interviews. Some patients had physical copies of medical records with results of previous tests, but none were attached to the referral letter. Many patients referred to the clinic did not have any basic results, including visual field examinations from outpatient clinics. Mostly, the purpose of the referral letter was a medical consultation, with no information justifying or explaining the request. To improve



glaucoma referral systems, more information should be provided to select patients requiring specialist health care. It is reasonable to develop a common referral template containing more clinical information. This would help select patients and avoid unnecessary referrals to the Glaucoma Clinic, especially for those who do not require specialist diagnostics or treatments. Moreover, a solution would be to establish therapeutic guidelines for patients with suspected or diagnosed glaucoma, in local ophthalmological health centers. Therefore, only patients for whom all appropriate therapeutic possibilities were exhausted in local health centers, would be referred to our clinic. Thus, we could avoid unnecessary referrals, optimize health management costs and reduce waiting times to tertiary centers.

The majority of referrals were from other ophthalmologists, with requests for medical consultation. The Glaucoma Outpatient Clinic has excellent diagnostics and surgical treatment methods, and provides patient solutions not available at outpatient clinics.

According to Founti et al. [4], similar observational outcomes were observed in other European countries e.g. more than half of all referrals to glaucoma clinics in Hungary, Slovenia, Italy and Greece were issued by other ophthalmologists. In some instances, self-referrals were also possible. Approximately 15% of patients in our study were referred by primary health care doctors, similar to other European countries [6]. However in the UK, the majority of referral letters to tertiary glaucoma specialist practices were initiated by optometrists [7]. In contrast to the UK model of cooperation, the cooperation model between optometrists and ophthalmologists is not commonly approved by European countries, including Poland. Bowling et al. outlined this model, but suggested developing standardized referral guidelines, based on IOP values  $> 21$  mmHg, with any other criteria (suspicious optic disc/visual field, narrow angle, family history or others), or a single IOP criteria with a raised threshold value ( $> 26$  mmHg) [7]. Criteria combination appears to be a reasonable referral option for patients with lower IOP, thereby increasing accuracy of the referral system.

In our study, the majority of referrals to the clinic were reasonable; approximately 70% of patients required further investigation. The average patient IOP who required active monitoring in the clinic was higher than patients discharged from further ophthalmological review, with an

average IOP values of 18.3 mmHg and 16.7 mmHg, respectively. The major role of outpatient ophthalmology clinics is to monitor patients with glaucoma or suspected glaucoma, including IOP assessments which are recommended in over 80% of patients. Approximately 22% of all referral diagnoses were inappropriate (other diagnoses were made after examination in the clinic in comparison to referral diagnoses). Equally, in 8.2% of patients diagnosed with glaucoma and treated in local ophthalmological health centers, the diagnosis was rejected in our clinic. These situations could be due to a low availability of specialist ophthalmological tests for precise diagnoses, usually performed in tertiary referral hospitals.

According to our in-house recommendations, chronic treatment was implemented in approximately 80% of patients. It is worth noting that not all patients diagnosed with glaucoma required chronic treatment. Indeed, 5 patients (3.3%) out of 153 diagnosed with glaucoma, were advised against medication. In 8 patients diagnosed with OHT (37.5%), treatment was suggested in only 3 of them. In 17 patients with suspected glaucoma, 15 (88.2%) were recommended treatment. The role of the clinic was to establish or improve treatments set by local ophthalmologists. In patients with stable glaucoma, a single visit to the clinic was enough to resolve diagnostic or treatment problems, but such patients were recommended to remain under the care of district ophthalmology clinics.

## CONCLUSIONS

Our study outcomes suggest that improvements are required for referral systems to specialized glaucoma clinics in Poland. A standardized template of a referral letter should include clinical information and examinations such as IOP (baseline, current), gonioscopy, the best corrected visual acuity and treatment details, fulfilling specified criteria. Such an approach would be critical in selecting patient groups that require the most specialist healthcare. Considering the long waiting times for our Glaucoma Outpatient Clinic, it is important to select patients requiring immediate treatment, as distinct to stable patients. A limitation of our study is the fact that retrospective data came from only one specialized glaucoma clinic, however we believe the issues raised here affect the majority of ophthalmology consultation centers across Poland.

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