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Follow-up and Therapeutic Patient Education in Ophthalmology

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Follow-up and Therapeutic Education of Patients in Ophthalmology

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I. Introduction

1.1 General Concepts and Main Objectives of Therapeutic Patient Education (TPE)

A) Definition and Historical Background

Therapeutic Patient Education (TPE) is a structured, evidence-based educational approach designed to help patients with chronic diseases actively manage their own health. The WHO (1996) defined it as an approach “aimed at helping patients acquire or maintain the skills needed to manage their lives with a chronic disease” [1]. In 2007, the French HAS identified two core dimensions: the acquisition of self-care skills and the mobilization of coping skills [2].

B) Core Principles of TPE

TPE is fundamentally different from simple patient information. It is built on well-organized educational activities with psychosocial support at its center [3], and guided by four core principles: patient autonomy — promoting informed decision-making and self-efficacy; personalization — adapting the program to each patient's unique needs and cognitive abilities; comprehensive approach — addressing biomedical, emotional, psychological, and social dimensions; and collaboration — positioning healthcare providers as facilitators, not authorities.

C) Main Objectives of TPE

. Empowerment and Active Patient Role.

TPE shifts the patient from a passive recipient of care to an active actor in their therapeutic journey, involved in clinical decision-making. Research confirms that TPE is highly efficient in developing self-management skills, leading to greater long-term treatment adherence.

. Acquisition of Self-Care and Coping Skills.

TPE targets practical competencies such as symptom monitoring, medication management, lifestyle adaptation (diet, exercise), complication prevention, and emotional or stress management.

D) . Adherence, Quality of Life, and Shared Decision-Making.

By clearly explaining treatment rationale and side effects, TPE improves adherence and leads to better clinical outcomes. Through active self-management, it reduces hospitalizations and improves quality of life. TPE also promotes shared decision-making, integrating patients' values and goals into treatment planning, thereby increasing satisfaction and autonomy.

E) . TPE as an Individualized and Ongoing Process.

A TPE program must be individually tailored and continuously adapted to each patient's needs, motivation, and life context. It should be proposed shortly after diagnosis and revisited throughout the course of illness, regardless of age, disease stage, or socio-educational background.

.F) Relevance of TPE in Ophthalmology

Ophthalmology is a field where TPE is particularly critical. Chronic eye diseases such as glaucoma, diabetic retinopathy, and age-related macular degeneration require long-term management, yet many patients rely entirely on their physicians with limited personal understanding of their condition. Lack of patient engagement in ophthalmology can lead to irreversible vision loss, making structured TPE a critical component of comprehensive eye care.

1.2 Contribution of Therapeutic Patient Education to the Management of Chronic Diseases

Chronic diseases are recognised as the leading cause of morbidity and mortality worldwide, accounting for a substantial proportion of health expenditures and representing a growing challenge for health systems. In this context, Therapeutic Patient Education (TPE) has emerged as a cornerstone of chronic disease management, offering a structured approach to empower patients and optimise health outcomes. The World Health Organization (WHO) defines TPE as “a continuous process, integrated into health care, patient-centred, and aimed at helping patients to acquire and maintain the abilities and skills they need to live optimally with their disease” [1].

Since this foundational definition was established, TPE has evolved into a multidisciplinary discipline encompassing clinical, behavioural, and educational sciences. A growing body of evidence supports the effectiveness of TPE programmes in improving patient outcomes across a range of chronic diseases. Studies have demonstrated improvements in medication adherence, reduction in disease-related complications, and better patient satisfaction. Holman and Lorig

notably showed that structured self-management education reduces emergency visits and hospitalisations, generates cost savings for health systems, and improves patients' sense of control over their disease [3].

In the field of ophthalmology, similar findings have been reported: patients who received structured educational interventions showed better adherence to topical treatments and demonstrated greater awareness of the importance of regular follow-up appointments [4].

Digital health technologies, including mobile applications and web-based platforms, have further expanded the reach and effectiveness of TPE, enabling remote patient education and real-time monitoring [5]. Eysenbach coined the term “e-health” to describe the use of information and communication technologies for health-related purposes, and subsequent research has confirmed the potential of these tools to enhance patient empowerment and education [6].

1.3 Historical Background and International Context of TPE

Therapeutic Patient Education (TPE) evolved from early 20th-century, top-down instruction into a modern, patient-centered, skill-based approach for managing chronic diseases. Originating with insulin therapy in 1922, it shifted in the 1970s toward humanistic pedagogy, now focused on patient empowerment, autonomy, and improved quality of life as defined by the WHO.

Key Historical Periods of TPE

Birth (Early 1920s). The birth of TPE is linked to the 1921/1922 discovery and usage of insulin, requiring diabetic patients to learn self-management, as noted in studies from HAL Sorbonne Université and ScienceDirect.

First Period (1920s–1970s). Pedagogy was vertical, authoritative, and passive, focusing on obedience to medical instructions.

Second Period (1970s–1990s). A shift toward humanist, active, and constructivist education, where patients became “auto-carers,” as seen in publications from Cambridge Media Journals and ScienceDirect.

Third Period (2000s–Present). Dominated by skill-based approaches and management by objectives to enhance patient autonomy.

Key Historical Milestones

1972. Dr. Leona Miller demonstrated that structured education improved independence and reduced medication reliance in diabetic patients.

1980s–1990s. Meta-analyses (e.g., Devine et al., 1986) proved the clinical, cost-saving benefits of psychoeducational interventions.

Modern Era. TPE is now a recognized, essential part of chronic disease management, supported by studies focused on behavioral changes.

1.4 Evolution of Therapeutic Patient Education (TPE) Practices in Algeria

From Independence to Institution-Building

Algeria's journey toward structured Therapeutic Patient Education is deeply rooted in its post-independence reconstruction. When the nation gained sovereignty in 1962, its healthcare infrastructure was nearly nonexistent — with only five ophthalmologists in the entire country. In the decades that followed, the Algerian health system was built around a curative, provider-centered model, in which the patient remained a passive recipient of care. Structured TPE, as defined by the World Health Organization — a continuous, integrated, and patient-centered educational process — was slow to permeate clinical practice, particularly within specialized fields such as ophthalmology.

A Shifting Disease Landscape: The Silent Call for TPE*

What fundamentally changed the equation was not a policy decision, but an epidemiological one. Algeria has experienced an accelerating transition toward chronic non-communicable diseases, placing new and pressing demands on its healthcare system. In ophthalmology, this transition carries particularly serious consequences: the prevalence of cataract stands at 13.8%, glaucoma at 4.6%, and diabetic retinopathy at 2.4% [7]. These figures represent thousands of patients who must learn to live with, monitor, and actively manage their condition over a lifetime. Without adequate patient education, disease progression becomes almost inevitable.

TPE in Algerian Ophthalmology: An Emerging Practice

Glaucoma: When Education Becomes the Treatment. Among chronic ocular diseases, glaucoma is where TPE has received the most explicit attention in Algeria. Its defining feature — a slow, painless destruction of the optic nerve — makes patient awareness and treatment adherence not merely desirable, but clinically critical. In Algeria, adherence is recognized as the foremost challenge in glaucoma management, and TPE is considered essential to help patients accept a lifelong therapeutic regimen. The Algerian Glaucoma Society (SAG) has emerged as a key institutional actor in promoting awareness, reflecting a growing professional consensus: prescribing treatment is not enough — patients must genuinely understand and own their disease.

Vision 2020: A National Turning Point.

A broader institutional commitment came with Algeria's formal adhesion to the global blindness prevention initiative. In October 2009, Algeria officially endorsed Vision 2020: The Right to Sight, and the Ministry of Health subsequently developed a strategic three-year plan (2013–2015), bringing together ophthalmologists, epidemiologists, and infectious disease specialists. While initially focused on surgical conditions, this initiative extended to encompass screening programs and the management of blinding diseases within primary care centers. For the first time, ophthalmic care in Algeria was being conceptualized beyond surgical intervention — toward prevention, follow-up, and patient empowerment: the very foundations upon which TPE is built.

II. Ophthalmology and the Need for TPE

2.1 Overview of Eye Anatomy and Physiology, and the Importance of Visual Function in Daily Life

An understanding of ocular anatomy and physiology is essential for both clinicians and patients engaged in any TPE programme related to ophthalmological conditions. Educating patients about the structure and function of the eye enables them to better comprehend the pathophysiological mechanisms underlying their disease and to appreciate the importance of compliance with treatment.

Anatomy of the Human Eye

The human eye is a complex sensory organ approximately 24 mm in diameter. It is composed of three principal layers: the outer fibrous tunic (comprising the cornea and sclera), the middle vascular tunic or uvea (comprising the iris, ciliary body, and choroid), and the inner neural tunic (the retina). The anterior segment includes the cornea, anterior chamber filled with aqueous humour, lens, and iris. The posterior segment comprises the vitreous humour, retina, choroid, and optic nerve. The cornea, the transparent anterior surface of the eye, is responsible for approximately two-thirds of the total refractive power of the eye. The lens, situated behind the iris, accounts for the remaining refractive power and enables accommodation. The retina — a thin, light-sensitive layer of neural tissue — contains two types of photoreceptors: rods, responsible for scotopic (low-light) and peripheral vision, and cones, concentrated in the fovea and responsible for photopic (colour) and high-resolution central vision.

Physiology of Vision

The process of visual perception begins when light enters the eye through the cornea and is focused by the lens onto the retina. Photoreceptors convert light into electrical signals through a photochemical process (phototransduction), which are then transmitted via the optic nerve to the lateral geniculate nucleus of the thalamus and ultimately to the primary visual cortex in the occipital lobe. The visual pathway is organised retinotopically, meaning that spatial relationships on the retina are preserved throughout the cortical representation.

Intraocular pressure (IOP), maintained by the dynamic equilibrium between aqueous humour production by the ciliary body and its drainage through the trabecular meshwork, plays a critical physiological role. Disruptions in this balance, as observed in glaucoma, can result in optic nerve damage and irreversible visual field loss.

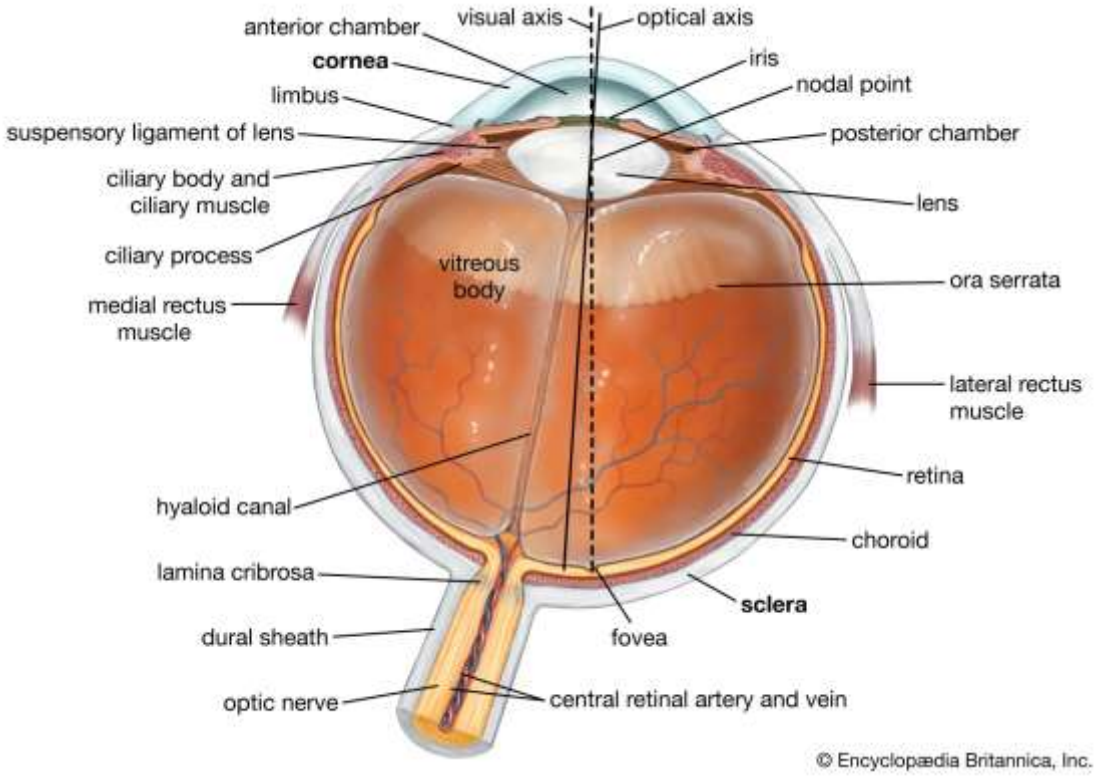


Figure 1. Anatomical diagram of the human eye, showing the anterior and posterior segments (© Encyclopædia Britannica, Inc.).

Importance of Visual Function in Daily Life

Vision is one of the most critical senses for human functioning, enabling independence, mobility, reading, work, and social interaction. The global burden of visual impairment is substantial: the WHO estimated that in 2010, approximately 285 million people worldwide were visually impaired, of whom 39 million were blind [8]. More recent estimates from Bourne et al. projected that by 2020, the number of people with moderate-to-severe visual impairment could exceed 200 million, with blindness affecting around 43 million [9]. The leading causes of visual impairment globally include uncorrected refractive errors, cataracts, glaucoma, diabetic retinopathy, and age-related macular degeneration [10].

These conditions not only impair visual acuity but also compromise patients' capacity to perform activities of daily living, including driving, reading, and recognising faces. Stelmack et al.

demonstrated that low-vision rehabilitation programmes significantly improve functional abilities and quality of life in affected patients [11]. The implications of visual impairment thus extend well beyond clinical metrics, profoundly affecting patients' autonomy, social participation, and emotional well-being.

2.2 Why Is TPE Essential in Ophthalmologic Care?

Therapeutic Patient Education (TPE) is essential in ophthalmologic care because many eye diseases are chronic, progressive, and highly dependent on patient behavior. Visual outcomes often rely not only on medical or surgical treatment, but also on how well patients understand, accept, and manage their condition over time.

Many ophthalmologic diseases are chronic and asymptomatic. Conditions such as glaucoma, diabetic retinopathy, dry eye disease, and age-related macular degeneration (AMD) often progress silently, especially in early stages. Because patients may not feel symptoms, adherence to long-term treatment is frequently poor. TPE helps patients understand the nature of their disease, the risks of non-adherence, and the importance of regular follow-up, even in the absence of discomfort or visual loss.

Treatment success depends heavily on patient adherence. Ophthalmologic treatments often require daily, precise, and long-term actions, such as instilling eye drops correctly, respecting treatment schedules, or maintaining hygiene for contact lenses. TPE improves patients' practical skills, confidence, and motivation, leading to better adherence and, ultimately, improved clinical outcomes.

Visual impairment has a strong psychosocial impact. Vision loss affects autonomy, professional life, social relationships, and emotional well-being. Anxiety, denial, frustration, and depression are common reactions. TPE integrates psychosocial support, helping patients develop coping strategies, adapt to functional limitations, and maintain quality of life.

Patients must actively participate in their care. In ophthalmology, patients play a major role in disease management: monitoring symptoms, recognizing warning signs, attending follow-up visits, and adjusting lifestyle factors (e.g., glycemic control in diabetic eye disease). TPE empowers patients as active partners rather than passive recipients of care, which is essential for long-term disease control.

Prevention of complications and disease progression. Poor understanding of eye disease often leads to delayed consultations, incorrect medication use, and avoidable complications, including

irreversible vision loss. By improving health literacy and self-care skills, TPE reduces preventable progression and enhances early detection of complications.

Adaptation to treatment and surgical pathways. Ophthalmologic care frequently includes pre- and post-operative phases (e.g., cataract surgery, glaucoma surgery, corneal procedures). TPE prepares patients for these stages by explaining expectations, post-operative care, warning signs, and rehabilitation, reducing anxiety and improving recovery.

Alignment with a bio-psycho-social approach to eye care. Vision is deeply connected to identity, independence, and social participation. TPE allows ophthalmologic care to move beyond a purely biomedical model by integrating psychological, behavioral, and social dimensions, leading to more holistic and patient-centered care.

2.3 Barriers to the Implementation of TPE in Ophthalmology*

Patient-Related Barriers

Low health literacy represents one of the most well-documented obstacles [12]. Educational materials are frequently written at a reading level ill-suited to the majority of patients, compromising comprehension and information integration [13]. Knowledge gaps regarding diabetic retinopathy remain widespread, and up to 50% of glaucoma patients fail to adhere to treatment due to absent subjective disease perception [14]. Approximately 40% of diabetic patients report not attending ophthalmology appointments in the absence of perceived symptoms, remaining unaware of the preventable blindness risk posed by undetected retinopathy [15].

Healthcare System and Clinician-Related Barriers

Time constraints represent the primary obstacle reported by clinicians, as quality therapeutic education requires several minutes per consultation — incompatible with high-volume outpatient settings. Interdisciplinary collaboration remains insufficient: nurses and optometrists are underutilised, shifting the entire pedagogical burden onto the ophthalmologist alone. Up to 50% of patients instil eye drops incorrectly — an error rarely identified or corrected during consultations. Educational materials lack cultural adaptation, and the procedural orientation of retina services marginalises TPE, perpetuating a cycle of non-adherence.

Socio-Economic and Logistical Barriers

Financial hardship directly undermines educational interventions. When medication costs exceed the patient's financial capacity, treatment abandonment takes precedence, rendering education practically void. Logistical constraints — frequent visits, geographic remoteness, and lack of transportation — are major dropout drivers, with loss-to-follow-up rates reaching up to 95% in vulnerable populations.

The Knowledge–Attitude–Practice Gap

Even when a patient possesses adequate knowledge and endorses treatment, behavioural translation into correct practice is not guaranteed. Didactic education alone proves insufficient without repeated hands-on training and supervised demonstration of practical skills such as correct eye drop instillation technique.

Implications for the Algerian Context

In Algeria, where health literacy deficits and significant economic constraints are prevalent, printed educational materials alone are demonstrably inadequate. Verbal counselling and video-based interventions have shown superior effectiveness. Crucially, structural barriers — including medication cost and transportation access — must be addressed as prerequisites to any disease-focused educational intervention, as patients facing unmet basic needs are unlikely to retain or act upon health education messages.

2.4 Impact of Chronic Ophthalmic Diseases on Patients: Psychosocial Well-Being

Chronic ophthalmic diseases exert a profound impact on the psychological, social, and emotional dimensions of patients' lives. The progressive and often irreversible nature of conditions such as glaucoma, diabetic retinopathy, and age-related macular degeneration (AMD) generates a significant psychosocial burden that must be addressed within any comprehensive management and education programme.

Psychological Consequences

Visual loss is frequently associated with high rates of depression, anxiety, and psychological distress. Rees et al., in a large population-based study, found a significant association between vision impairment and symptoms of depression, anxiety, and stress, even after adjusting for

sociodemographic variables and comorbidities [16]. Brody et al. similarly reported that patients with AMD exhibited elevated rates of depression, which were associated with reduced functional ability and poorer quality of life [17]. The fear of further vision loss constitutes an additional source of psychological distress. In glaucoma patients, Lim et al. found that a significant proportion of patients underestimated their risk of blindness, which paradoxically led to reduced motivation to adhere to treatment — highlighting the role of appropriate patient education in correcting misperceptions and reinforcing adherence behaviour [18].

Social and Functional Impact

Visual impairment impairs patients' capacity to engage in a wide range of daily activities. Ramulu reviewed the relationship between glaucoma and disability, concluding that even moderate levels of visual field loss significantly impair driving, reading, and mobility, with consequences for patients' independence and employment [19]. Similarly, Lamoureux et al. found that diabetic retinopathy substantially reduced participation in instrumental activities of daily living such as managing finances, preparing meals, and using transportation [20]. The social consequences of visual loss are also considerable. Patients frequently report social isolation, difficulties in recognising faces, and reduced participation in leisure activities. Fenwick et al., in a qualitative study of patients with diabetic retinopathy, highlighted that patients experience significant emotional reactions including grief, frustration, and a sense of loss of identity when confronted with progressive visual decline [21].

Impact on Quality of Life and Treatment Adherence

Health-related quality of life (HRQoL) is consistently lower among patients with chronic ophthalmic conditions compared with the general population. The psychological and social burden of visual impairment also has direct implications for treatment adherence. Dunbar-Jacob and Mortimer-Stephens highlighted that depression and reduced self-efficacy are key predictors of poor adherence to long-term medical regimens in chronic disease [22]. In the context of ophthalmology, poor adherence to topical medications — particularly in glaucoma — is a well-documented challenge that significantly compromises therapeutic outcomes. These observations underscore the necessity of integrating psychosocial assessment and support into TPE programmes for ophthalmic patients. Dreer et al. demonstrated that cognitive appraisals of disease-related threat and coping self-efficacy mediate the relationship between visual impairment and functional disability, suggesting that educational interventions targeting these factors may improve patients' adaptive functioning [23].

III. Major Ophthalmic Diseases Benefiting from TPE*

Diabetic retinopathy and Age-Related Macular Degeneration (AMD) are leading causes of vision loss, requiring strict blood sugar, blood pressure, and cholesterol control to prevent progression. Early, asymptomatic stages require annual comprehensive dilated eye exams for early detection and treatment. Key treatments include intravitreal injections, laser photocoagulation to seal leaking blood vessels, and lifestyle management.

3.1 Diabetic Retinopathy (DR) Education

What it is: A diabetes complication damaging retinal blood vessels.

Key Symptoms: Often none in early stages; later, symptoms include blurry vision, floaters, and sudden vision loss.

Prevention: Maintain an A1C below 7%, manage blood pressure, and quit smoking.

Treatment: Anti-VEGF injections stop new blood vessel growth and reduce macular edema; laser treatment seals leaking vessels to protect central vision.

Action Plan: Yearly dilated eye exams are essential, even if vision seems fine.

3.2 Glaucoma Education

Glaucoma is a chronic, often symptomless eye disease that damages the optic nerve due to increased eye pressure, requiring lifelong management to prevent irreversible vision loss. Key patient education focuses on strict, daily medication adherence (eye drops), regular comprehensive eye exams, and understanding that treatments aim to slow progression, not reverse damage.

Key Aspects of Patient Education for Glaucoma

Medication Adherence: Using prescribed eye drops exactly as directed, even if no symptoms are present. Missing doses can cause eye pressure to rise.

Understanding the Disease: Open-angle glaucoma often has no symptoms until significant vision loss has occurred.

Lifelong Monitoring: Regular check-ups with an ophthalmologist are necessary to monitor intraocular pressure (IOP) and visual fields.

Side Effect Management: Inform patients about potential eye drop side effects, such as irritation, and encourage reporting them to their doctor.

Lifestyle Adjustments: Regular, moderate exercise can help lower eye pressure, but patients should discuss safe exercises with their doctor. Maintain a healthy diet, limit excessive caffeine intake, and avoid smoking. Avoid drinking large amounts of liquid in a short time. Advise patients to encourage family members to get screened, as glaucoma can be hereditary.

Support for Patients

Vision rehabilitation resources, such as magnifying devices or lighting improvements, should be offered to those already experiencing vision loss. Supportive tools — timers or apps — can help patients remember to take eye drops. Clear, jargon-free educational materials improve understanding and self-management.

3.3 Age-Related Macular Degeneration (AMD) Education

What it is: A disease damaging the macula, leading to central vision loss.

Risk Factors: Age, genetics, smoking, and high blood pressure.

Symptoms: Blurry central vision, straight lines appearing wavy, or dark spots.

Management: AREDS2 supplements may slow progression of dry AMD; injections are used specifically for wet AMD to stop abnormal vessel growth; a diet rich in leafy greens and monitoring with an Amsler grid are also recommended.

When to Seek Immediate Care: Contact an eye professional immediately for sudden, severe blurry vision; a sudden increase in spots or “floaters”; or a “curtain” coming down over the vision.

3.4 Dry Eye Syndrome Education

What is it: Dry eye syndrome, or keratoconjunctivitis sicca, is a multifactorial disease of the ocular surface characterized by a loss of tear film homeostasis, tear film instability, and hyperosmolarity.

It causes ocular discomfort, inflammation, and visual disturbances resulting from insufficient tear production or excessive evaporation [24].

Pathophysiology: Involves tear film hyperosmolarity (increased saltiness of tears) and ocular surface inflammation.

Dry eye syndrome (DES) education programs improve patient outcomes by enhancing knowledge of the chronic, often progressive, nature of the condition, leading to better treatment compliance and reduced symptoms. Effective education focuses on lifestyle modifications (e.g., reducing screen time, using humidifiers), proper eyelid hygiene (warm compresses), and consistent use of preservative-free tears.

Core Components of Patient Education Programs

Disease Understanding: Educating patients that dry eye is a chronic condition that requires long-term management, not a quick fix.

Environmental and Lifestyle Modifications: Using the 10-10-10 rule (every 10 minutes, look at something 10 feet away for 10 seconds); avoiding direct air conditioning, fans, and smoke; using wraparound sunglasses; increasing hydration and nutrients (omega-3 fatty acids).

Self-Care Techniques: Daily warm compresses (5 minutes) and gentle eyelid massage to treat Meibomian Gland Dysfunction (MGD); encouraging frequent, complete blinks to maintain tear film.

Treatment Compliance and Usage of Aids: Explaining the necessity of consistent medication use, even when symptoms improve, to prevent relapse. Handouts, videos, and, in some cases, nursing-led programs reinforce instructions on how to properly apply eye drops and perform lid scrubs.

Key Education Goals and Impact on Outcomes

Reduce symptoms, improve quality of life, protect the ocular surface from severe complications, and ensure patients follow through with recommended, often complex, therapeutic regimens. Studies indicate that patients who receive structured, tailored education, addressing knowledge, attitudes, and practices (KAP), experience significant improvements in both the physical symptoms of dry eye and their overall visual functioning.

IV. Implementation of TPE Programs in Ophthalmology

4.1 Planning and Structure of a TPE Program in Ophthalmology

Therapeutic Patient Education (TPE) is a strategy based on well-organized educational and learning activities, where psychosocial support is considered a fundamental part of treatment. It aims to empower patients to understand their condition, participate in clinical decision-making, and effectively self-manage their disease through improved knowledge, self-care skills, and treatment adherence.

The Four Structural Steps of a TPE Program

Step 1 — Educational Diagnosis. The program begins with an individual assessment of the patient, aiming to inventory their knowledge about the disease, identify unmet needs, and measure the impact of the condition on their daily lives — through questionnaires, individual interviews, and focus groups.

Step 2 — Definition of Educational Objectives. Based on the diagnosis, personalized and measurable objectives are set: understanding disease progression, recognizing warning signs, mastering treatment techniques, and adopting protective behaviors.

Step 3 — Educational Sessions. Most ophthalmology patients prefer personalized, one-on-one education combined with printed or digital materials. The “teach-back” technique is particularly effective: the patient is asked to repeat information in their own words to confirm understanding. Tools used include illustrated leaflets, anatomical diagrams, drop instillation demonstrations, and video modules.

Step 4 — Evaluation. Evaluation is both individual and programmatic, using indicators such as patient knowledge scores before and after sessions, treatment adherence rates, and clinical outcomes like intraocular pressure control or visual acuity stability.

The Multidisciplinary Team

A TPE program requires coordinated involvement of the ophthalmologist, orthoptist, nurse, psychologist, and general practitioner. The ophthalmologist leads clinical diagnosis and validates objectives; the nurse teaches self-care and monitors adherence; the psychologist supports patients with significant visual loss. The quality of the program depends directly on the competencies of the professionals involved, making their training an essential pillar.

Adaptation to Specific Ophthalmic Conditions

The program structure must be tailored to each pathology: glaucoma requires lifelong drop adherence and understanding of silent disease progression; diabetic retinopathy requires glycemic control education and systematic retinal screening; AMD requires self-monitoring with the Amsler grid and understanding the rationale behind anti-VEGF injections; and post-surgical patients require education on postoperative drop use, activity restrictions, and signs of complications.

4.2 Educational Methods and Tools in the Implementation of TPE Programmes

The effective implementation of therapeutic patient education in ophthalmology requires the careful selection and combination of educational methods and tools that are adapted to the specific visual, cognitive, and psychosocial needs of the target population. A wide range of approaches has been developed and evaluated, spanning traditional didactic methods, interactive workshops, visual aids, and emerging digital technologies.

a) Visual Aids.

Given the visual nature of ophthalmological conditions, visual aids occupy a central role in patient education. Anatomical diagrams, photographs, and fundus imaging are commonly used to help patients understand the structure of the eye and the mechanisms of disease progression. Simulation tools — including low-vision simulators that replicate the visual experience of patients with specific conditions — have also proven valuable in educational settings, particularly for healthcare professionals and patients' caregivers, by fostering empathy and improving understanding of functional limitations. Written educational materials, when appropriately designed with adequate font size, contrast, and simplified language, remain important tools for reinforcing verbal information provided during consultations.

B) Group Workshops and Structured Educational Sessions.

Group-based educational programmes and workshops represent a well-established modality of TPE delivery. They provide a structured framework for imparting knowledge while simultaneously facilitating peer support and shared experience among patients facing similar challenges. Williams et al., in a systematic review of rehabilitation and education in glaucoma, found that

structured group interventions significantly improved patients' disease knowledge, self-efficacy, and quality of life [25]. Role-play, case studies, and skills demonstrations are frequently incorporated to promote active learning and reinforce practical competencies.

C) Digital Tools and e-Health Solutions.

The rapid development of digital health technologies has introduced new opportunities for the delivery of TPE in ophthalmology. Mobile applications dedicated to chronic disease management offer features such as medication reminders, self-assessment tools, educational content, and tele-consultation functionalities. Murray et al. conducted a Cochrane review of interactive health communication applications and concluded that these tools can improve knowledge, health behaviours, and clinical outcomes in patients with chronic conditions [5]. Tele-ophthalmology platforms enable remote monitoring of conditions such as diabetic retinopathy through the transmission of retinal images for specialist review, thereby extending the reach of ophthalmic services to underserved populations.

D) Practical Considerations for Implementation.

The implementation of TPE programmes in ophthalmology must account for the specific challenges posed by visual impairment. Educational materials must be adapted to patients' visual capabilities, with appropriate use of large print, high-contrast formatting, and audio or tactile alternatives where necessary. The involvement of a multidisciplinary team is essential to ensure the comprehensive coverage of patients' educational, therapeutic, and psychosocial needs. Nolte et al. demonstrated, in a national outcomes survey, that participation in structured self-management programmes was associated with broad and durable benefits across multiple dimensions of patient-reported outcomes [26].

4.3 The Role of Patient Education in Preventing Visual Impairment

A) The Neuropsychology of Compliance

Education is the only tool that bridges the gap between a medical diagnosis and a patient's daily habits. In conditions like glaucoma, the brain “fills in” missing visual data through a process called perceptual completion — patients often do not notice they are losing vision until a substantial proportion of the optic nerve is already damaged. Education must explain this neurological illusion so patients understand why treatment is needed despite “seeing fine.” The Health Belief

Model (HBM) is also useful: effective education assesses a patient's perceived barriers (e.g., cost of eye drops) against the perceived threat (blindness), aligning the treatment plan with the patient's personal values — such as maintaining the ability to drive or read — to support near-optimal adherence.

B) Clinical Prevention through Lifestyle Literacy

Education transforms clinical outcomes by addressing the root systemic causes of ocular damage. Programs focused on controlling glycaemia, blood pressure, and cholesterol are highly effective at preventing diabetic vision loss. Educating patients with age-related macular degeneration on antioxidant supplementation (lutein, zeaxanthin) and smoking cessation can meaningfully reduce the risk of progression to advanced disease. Detailed education regarding high-energy visible (HEV) light and cumulative UV exposure also helps prevent early-onset cataracts and pterygium, particularly in high-altitude or coastal regions.

C) Preventing Iatrogenic (Self-Inflicted) Vision Loss

A substantial portion of visual impairment stems from improper use of medical devices, which only education can address. Contact lens hygiene education is essential to prevent severe infections such as Acanthamoeba keratitis, often caused by exposing lenses to tap water. After cataract surgery, timely patient education allows patients to distinguish normal healing from warning signs of retinal detachment or endophthalmitis; recognising a “curtain over the eye” or sudden floaters within the first hours after surgery can be the difference between preserved sight and permanent vision loss.

D) Behavioral Interventions for the Modern Era

In children, education is increasingly framed as a public health priority for myopia prevention: encouraging at least two hours of outdoor time daily is associated with reduced myopia progression, lowering the lifelong risk of myopic maculopathy and glaucoma. For adults, education on the 20-20-20 rule (every 20 minutes, look 20 feet away for 20 seconds) helps prevent digital eye strain and the corneal surface changes associated with prolonged screen use.

E) Advanced Educational Tools and Socio-Economic Impact

Emerging tools such as virtual and augmented reality simulations, which show patients how their vision could deteriorate without treatment, and structured “teach-back” communication techniques, are increasingly used to reinforce long-term adherence. Beyond the clinical setting, patient education also carries an economic dimension: enabling communities to understand that simple, low-cost interventions such as glasses or cataract surgery can restore productivity helps break the cycle linking poverty and preventable blindness. Educating family caregivers,

particularly for elderly patients, on correct eye drop administration and safe home environments further reduces the risk of falls and secondary ocular trauma.

F) Summary: The Four Pillars of Vision Education

- Primary Prevention: awareness of exams (finding the disease before it finds you).
- Secondary Prevention: adherence to therapy (stopping the disease in its tracks).
- Tertiary Prevention: rehabilitation and low-vision training (maximizing remaining sight).
- Environmental Prevention: controlling light, ergonomics, and hygiene.

Conclusion of the Theoretical Framework

Therapeutic patient education represents an indispensable component of the comprehensive management of chronic ophthalmic diseases. By equipping patients with the knowledge, skills, and confidence necessary to actively engage in their care, TPE programmes have the potential to improve treatment adherence, slow disease progression, and enhance patients' quality of life. The integration of diverse educational modalities — including visual aids, group workshops, and digital tools — adapted to the unique needs of visually impaired patients, is essential for ensuring the effectiveness and accessibility of these programmes. Future developments in e-health technologies and personalised medicine are expected to further transform the landscape of patient education in ophthalmology, offering new possibilities for individualised, patient-centred care.

Practical Framework

Practical Framework – Plan

Abstract (Practical Section) — see page at the end of this document

List of Abbreviations

1. Methodology

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List of Abbreviations

Abbreviation	Definition
TPE	Therapeutic Patient Education
KAP	Knowledge, Attitudes, and Practices
mHealth	Mobile Health
IOP	Intraocular Pressure
DR	Diabetic Retinopathy
N	Sample size / number of respondents
%	Percentage of the total sample (n = 23) unless otherwise specified

1. Methodology

1.1 Study Design

This practical component of the dissertation is based on a descriptive, cross-sectional, observational study designed to assess the level of therapeutic adherence among patients followed for chronic ophthalmic conditions, with particular attention to glaucoma and diabetic retinopathy, and to explore patients' receptiveness toward a digital, application-based adherence support tool. The study did not aim to test a therapeutic intervention, but rather to characterize, in a defined sample, the knowledge, behaviours, and barriers that shape day-to-day adherence to topical and systemic ocular treatments, and to gather the patients' own perspective on the acceptability of a mobile health (mHealth) solution.

The choice of a cross-sectional design was guided by the exploratory nature of the research question and by the practical constraints of an end-of-cycle dissertation, which does not allow for longitudinal follow-up. A single-point-in-time questionnaire nonetheless allows for a meaningful snapshot of adherence-related knowledge, attitudes, and practices (KAP), which is the standard first step before designing a targeted intervention such as the mobile application discussed in Section 6.

1.2 Study Population

The target population consisted of adult patients under active follow-up for a chronic or recurrent ophthalmic condition requiring regular topical treatment (eye drops) and/or a structured therapeutic regimen. Conditions represented in the theoretical section of this dissertation — glaucoma and diabetic retinopathy in particular — were prioritised, but the questionnaire was kept open to other ocular conditions requiring sustained drop-based treatment (cataract post-operative care, dry eye disease, pterygium, keratoconus) in order to broaden the descriptive base and to allow comparison across disease groups.

Inclusion criteria

- Adult patients (18 years or older)
- Diagnosed with a chronic or sub-chronic ophthalmic condition requiring eye drops and/or a defined treatment schedule

- Currently under treatment or follow-up at the time of the survey
- Able to understand and respond to the questionnaire, with assistance from a family member where necessary

Exclusion criteria

- Patients with an acute, self-limiting ocular condition not requiring sustained treatment
- Patients unable to communicate their responses even with assistance (e.g. severe cognitive impairment) and without a reliable proxy respondent
- Incomplete questionnaires in which the core adherence items were left unanswered

1.3 Questionnaire Design

A structured, self-administered questionnaire was developed specifically for this study. It comprises 21 items, organised around five conceptual domains that reflect the multidimensional nature of therapeutic adherence as described in the theoretical section of this dissertation:

- Clinical and diagnostic background (time since diagnosis, main ocular condition)
- Health literacy and understanding of the disease and treatment (who provided the initial explanation, understanding of the purpose of the treatment, knowledge of side effects)
- Adherence behaviours and practical difficulties (forgetting doses, hygiene practices, ease and accuracy of instillation, cost-related interruptions)
- Attitudes and motivation (reasons for treatment discontinuation, perceived difficulty of daily adherence, interest in training)
- Prior exposure to therapeutic patient education (TPE) and openness to a digital adherence-support application

Most items used closed-ended, single-choice response formats (nominal or ordinal scales such as never / rarely / sometimes / often, or easy / difficult / very difficult), which facilitates both patient completion and subsequent statistical description. This format was chosen deliberately over open-ended questions to reduce respondent burden, given that many participants were elderly or had limited familiarity with self-administered surveys, and to allow direct quantitative comparison across items.

The questionnaire was distributed and completed electronically (Google Forms), with responses recorded with a timestamp. This mode of administration was chosen for its practicality, ease of centralised data collection, and compatibility with the time constraints of the dissertation.

1.4 Pilot Testing and Refinement of the Questionnaire

Prior to full deployment, the questionnaire was informally reviewed with a small number of patients and with the dissertation supervisor to check the clarity, ordering, and clinical relevance of the items, and to verify that the response categories (e.g. the four-level frequency scales used throughout) were intuitive for patients with varying levels of health literacy and digital familiarity. Minor wording adjustments were made following this review, principally to simplify phrasing around treatment side effects and around the description of the proposed mobile application in the final item, so that patients unfamiliar with the concept of a 'follow-up assistant' application could still understand and meaningfully answer the question. No major structural changes were required, and the resulting 21-item structure described in Section 1.3 was retained for the full data collection period.

1.5 Ethical Considerations

Participation in the survey was voluntary and anonymous. No directly identifying information (name, contact details, medical record number) was collected; only the timestamp of submission was recorded for administrative tracking of the data collection period. Patients were informed of the academic and non-commercial purpose of the survey prior to completion. As the study involved no intervention, no biological sampling, and no modification of the patients' usual care pathway, and given the anonymous, minimal-risk nature of the questionnaire, the study falls within the category of observational survey research typically conducted as part of end-of-cycle medical dissertations under the supervision of the thesis director.

1.6 Statistical Analysis

Given the descriptive objective of this section and the sample size obtained (n = 23), a purely descriptive statistical approach was adopted. Categorical variables are reported as absolute frequencies and percentages. The single continuous variable collected (time since diagnosis, in years) is described using measures of central tendency and dispersion (mean, median, range). Cross-tabulations were performed between the main ocular condition and the principal adherence indicators (frequency of forgetting doses, perceived difficulty of daily adherence, ease of instillation) in order to explore whether adherence patterns differ between disease groups, most notably between glaucoma and cataract patients, who together made up the

majority of the sample. Given the small sample size, no inferential statistical tests (chi-square, etc.) were applied; the cross-tabulations are presented and interpreted descriptively, and any apparent differences between subgroups should be read as hypothesis-generating rather than statistically confirmed.

Data were extracted from the questionnaire response sheet, cleaned, and coded in a structured spreadsheet before being processed for frequency counts, cross-tabulations, and graphical representation (bar charts) of each variable.

1.7 Summary Table of Questionnaire Variables

Table 1 below summarises the 21 substantive variables collected by the questionnaire, grouped by conceptual domain, together with their measurement scale. This table is provided as a methodological reference to accompany the item-by-item results presented in Section 3.

Table 1. Summary of Questionnaire Variables by Conceptual Domain

Variable	Conceptual domain	Measurement scale
Time since diagnosis	Clinical background	Numeric (years)
Main ocular condition	Clinical background	Nominal
Who explained the disease	Health literacy	Nominal
Understanding of treatment purpose	Health literacy	Ordinal (4 levels)
Knowledge of side effects	Health literacy	Ordinal (3 levels)
Frequency of forgetting a dose	Adherence behaviour	Ordinal (4 levels)
Action taken if a dose is forgotten	Adherence behaviour	Nominal (2 levels)
Hygiene practices before instillation	Adherence behaviour	Ordinal (4 levels)
Assistance received for treatment	Adherence behaviour	Nominal
Treatment interruption due to cost	Economic barrier	Binary
Ease of instillation	Adherence behaviour	Ordinal (4 levels)
Frequency of missing the eye	Adherence behaviour	Ordinal (4 levels)
Difficulty remembering the schedule	Adherence behaviour	Ordinal (4 levels)
Stopping treatment when feeling better	Motivational barrier	Ordinal (4 levels)
Main reason for possible discontinuation	Motivational barrier	Nominal

Perceived difficulty of daily adherence	Adherence behaviour	Ordinal (4 levels)
Interest in instillation training	Attitude / motivation	Ordinal (4 levels)
Prior attendance of a TPE session	Education exposure	Nominal
Perceived usefulness of TPE sessions	Education exposure	Ordinal (4 levels)
Recourse when treatment is not understood	Health literacy / behaviour	Nominal
Interest in a follow-up application	Attitude toward mHealth	Binary

2. Data Collection

2.1 Data Collection Period and Setting

Data collection took place between 13 November 2025 and 6 February 2026. Responses were collected progressively over this period, reflecting the practical recruitment conditions of an end-of-cycle dissertation conducted alongside clinical rotations. The bulk of responses (18 out of 23) were collected within the first week of data collection (13–20 November 2025), with a small number of additional responses obtained in December 2025 and February 2026 to reach a broader and more diverse sample.

2.2 Sample Size

A total of 23 valid, complete questionnaire responses were collected and retained for analysis. No response was excluded for missing core adherence data; all 23 respondents answered the full set of clinical and adherence-related items. This sample size is consistent with the scope and time frame of a preliminary, exploratory dissertation survey, though it should be interpreted as a limited convenience sample rather than as representative of the broader population of ophthalmology patients, a limitation discussed further in Section 5.

2.3 Recruitment and Administration Procedure

Patients were invited to complete the questionnaire during their routine ophthalmology follow-up visits or via a shared electronic link, in a convenience-sampling approach. The electronic (Google Forms) format allowed patients to complete the questionnaire at their own pace, either during the consultation waiting time or afterward, with assistance offered where needed (in particular for older patients less familiar with digital forms). Each submission was automatically time-stamped and stored in a centralised response sheet, which constitutes the raw data source for this analysis.

2.4 Data Preparation and Coding

The raw response sheet was exported and reviewed line by line. Each of the 21 substantive items was assigned a short variable name for analysis purposes (for example, the item on the frequency of forgetting a dose was coded as forget_frequency, and the item on interest in a follow-up application was coded as wants_app). Free-text nuances in the original answer categories were preserved as given by the respondent (e.g. distinguishing ‘somewhat useful’ from ‘very useful’ for the therapeutic education item) rather than being collapsed into broader categories, in order to retain the full granularity of patient perception.

The variable recording time since diagnosis was entered by respondents in heterogeneous formats (e.g. ‘2 years’, ‘8 months’, ‘6’); these entries were standardised to a single numerical scale expressed in years (with sub-year durations converted to a decimal fraction) to allow descriptive statistical treatment.

2.5 Data Quality Notes

Two data quality observations are noted for transparency. First, the item on the perceived usefulness of therapeutic education sessions (item 19) was answered by all 23 respondents, including the 17 patients (73.9%) who reported not having attended any such session (item 18); this suggests that a subset of patients answered this item hypothetically or that the branching logic of the form did not fully restrict the item to prior attendees. This should be kept in mind when interpreting the usefulness figures in Section 3.7, and is discussed as a limitation in Section 5. Second, the main disease category includes five conditions represented by only one respondent each (pterygium, keratoconus, diabetic retinopathy); these single-patient categories are reported for completeness but are not used for subgroup comparison given their insufficient size.

3. Results

This section presents the descriptive results of the 23 valid questionnaire responses, organised by conceptual domain: clinical background, health literacy, adherence behaviours, motivational and economic barriers, prior exposure to therapeutic education, and attitudes toward a digital adherence-support application. Each result is presented with its absolute frequency, relative frequency, and, where relevant, an accompanying bar chart.

3.1 Clinical Background

3.1.1 Main Ocular Condition

Among the 23 respondents, cataract (39.1%) and glaucoma (34.8%) together accounted for almost three-quarters of the sample, followed by dry eye disease (13.0%). Pterygium, keratoconus, and diabetic retinopathy were each represented by a single patient (4.3% each).

Table 2. Main Ocular Condition (n = 23)

Main ocular condition	N	%
Cataract	9	39.1%
Glaucoma	8	34.8%
Dry eye disease	3	13.0%
Pterygium	1	4.3%
Keratoconus	1	4.3%
Diabetic retinopathy	1	4.3%

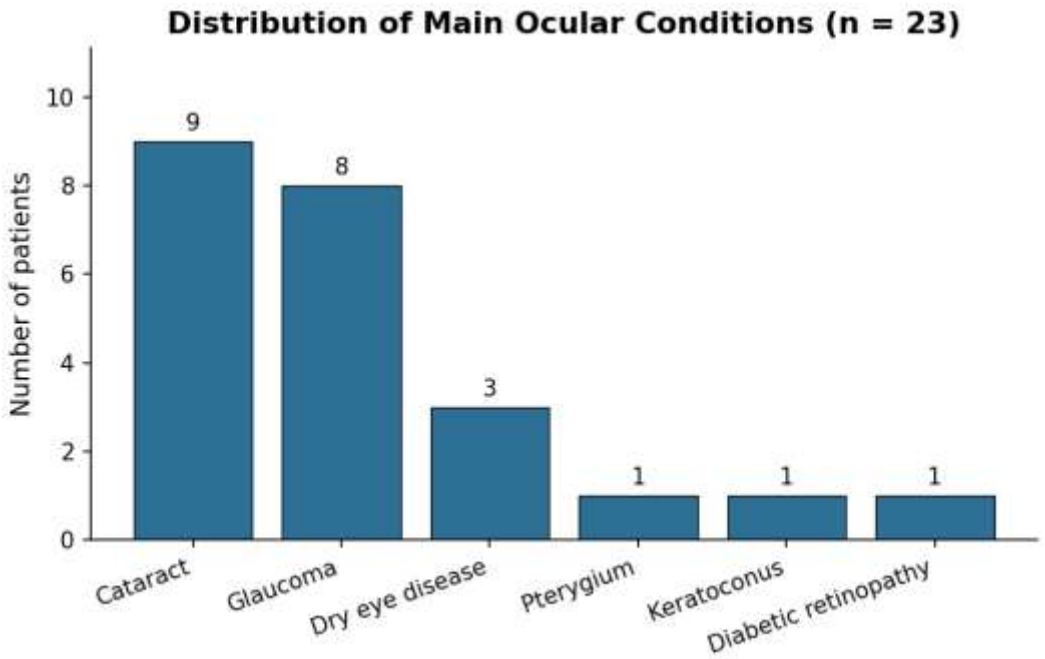


Figure 2. Distribution of the main ocular condition among respondents (n = 23).

3.1.2 Time Since Diagnosis

The time elapsed since diagnosis ranged from approximately 8 months to 20 years, with a mean of 4.4 years and a median of 4.0 years. Most patients (13/23, 56.5%) had been followed for their condition for 2 years or less, indicating that the sample includes a substantial proportion of relatively recently diagnosed patients alongside a smaller group of long-standing, chronically treated patients (including one patient followed for 20 years).

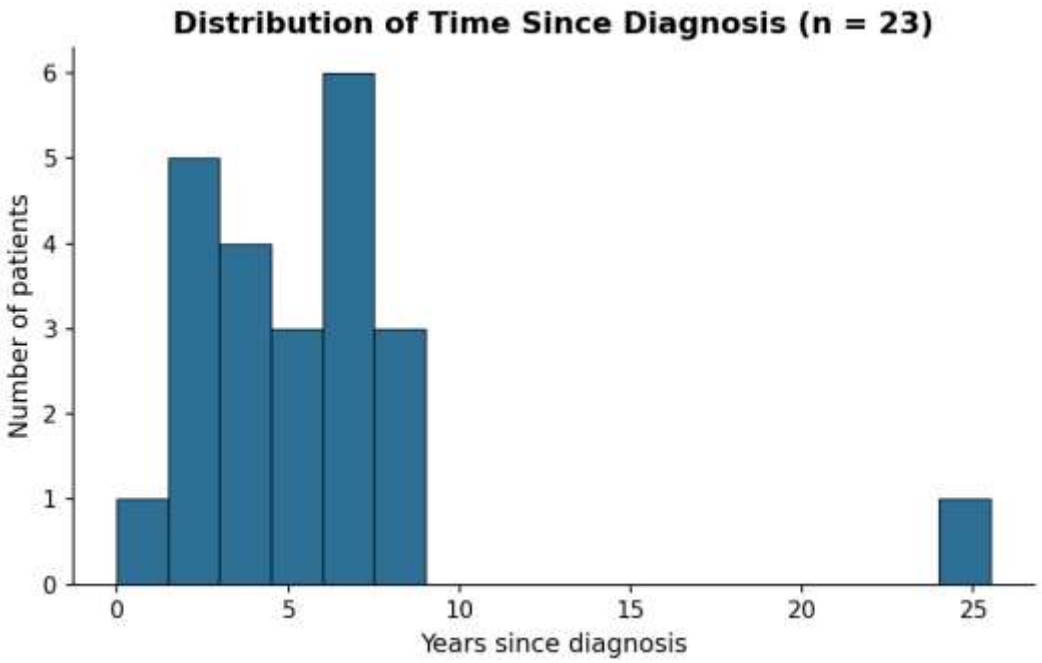


Figure 3. Distribution of time elapsed since diagnosis, in years (n = 23).

3.2 Health Literacy and Understanding of the Disease

3.2.1 Source of Initial Explanation

The ophthalmologist was reported as the person who mainly explained the disease in 21 of 23 cases (91.3%); two patients (8.7%) reported that no one had explained their condition to them.

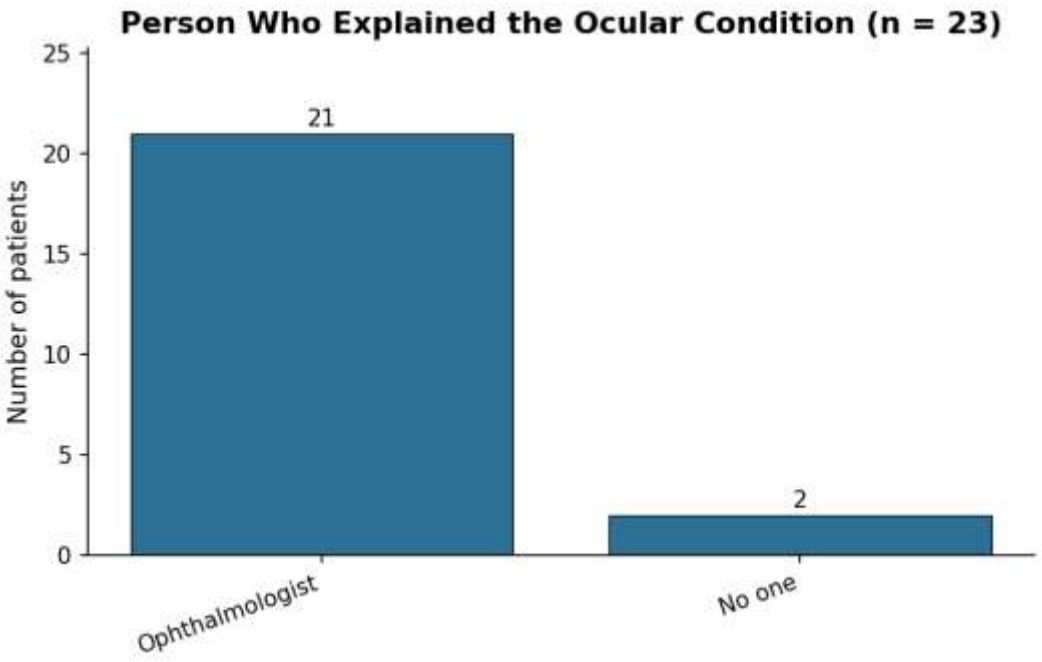


Figure 4. Person who mainly explained the ocular disease to the patient (n = 23).

3.2.2 Understanding of the Purpose of Treatment

Only 8 patients (34.8%) reported understanding the purpose of their eye drops or treatment 'for sure'; 6 (26.1%) reported only partial understanding, 5 (21.7%) reported understanding 'not much', and 4 (17.4%) reported not understanding it 'at all'. Taken together, this means that almost two-thirds of respondents (65.2%) have an incomplete or absent understanding of why they are being treated.

Table 3. Understanding of Treatment Purpose (n = 23)

Understanding of treatment purpose	N	%
Yes, for sure	8	34.8%
Partially	6	26.1%
Not much	5	21.7%
Not at all	4	17.4%

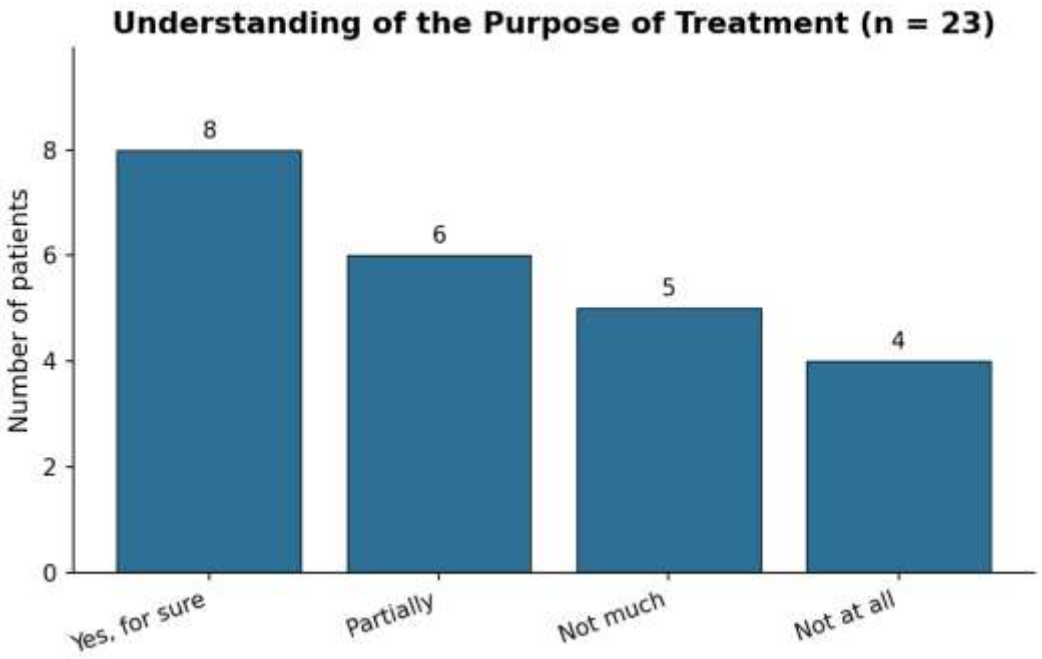


Figure 5. Patient-reported understanding of the purpose of their treatment (n = 23).

3.2.3 Knowledge of Side Effects

Knowledge of possible side effects was even more limited: 14 patients (60.9%) reported not knowing the possible side effects of their ocular medication, 5 (21.7%) were unsure, and only 4 (17.4%) reported knowing them.

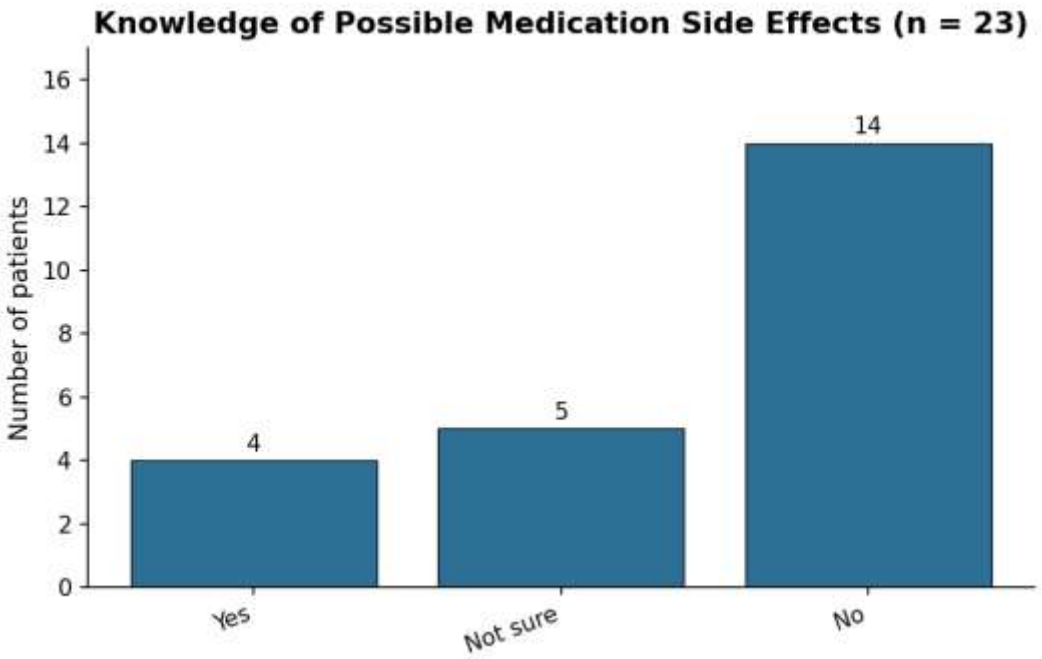


Figure 6. Patient-reported knowledge of possible medication side effects (n = 23).

3.3 Adherence Behaviours

3.3.1 Frequency of Forgetting a Dose

Regarding the frequency of forgetting a dose, 9 patients (39.1%) reported forgetting 'sometimes', 8 (34.8%) reported 'never' forgetting, 3 (13.0%) reported forgetting 'often', and 3 (13.0%) reported forgetting 'rarely'. Overall, a majority of patients (15/23, 65.2%) reported at least occasional forgetting.

Table 4. Frequency of Forgetting a Dose (n = 23)

Frequency of forgetting a dose	N	%
Never	8	34.8%
Rarely	3	13.0%
Sometimes	9	39.1%
Often	3	13.0%

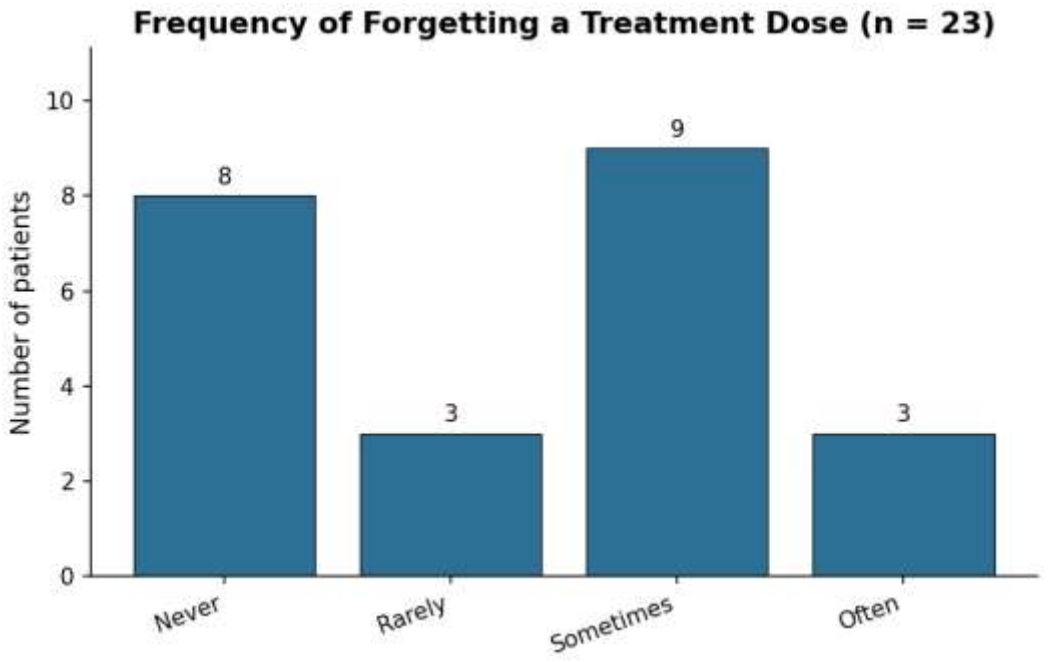


Figure 7. Self-reported frequency of forgetting a treatment dose (n = 23).

3.3.2 Response to a Forgotten Dose

When a dose is forgotten, patients were almost evenly split between simply skipping it (12/23, 52.2%) and administering it as soon as they remember (11/23, 47.8%). This near-even split highlights inconsistent practical knowledge of how to manage a missed dose, an issue directly addressed by the recommendations proposed in Section 6.

3.3.3 Hygiene Practices Before Instillation

Adherence to hygiene rules before instillation (e.g. handwashing) was reported as systematic (‘always’) by 8 patients (34.8%), ‘most of the time’ by 7 (30.4%), ‘sometimes’ by 6 (26.1%), and ‘never’ by 2 (8.7%).

3.3.4 Ease and Accuracy of Instillation

Instillation was reported as easy or very easy by 11 patients (47.8%: 43.5% easy + 4.3% very easy) and as difficult or very difficult by 12 patients (52.2%: 39.1% difficult + 13.0% very difficult) — a

near-even split indicating that practical, hands-on difficulty with the instillation technique affects roughly half of the sample.

Table 5. Ease of Instillation (n = 23)

Ease of instillation	n	%
Very easy	1	4.3%
Easy	10	43.5%
Difficult	9	39.1%
Very difficult	3	13.0%

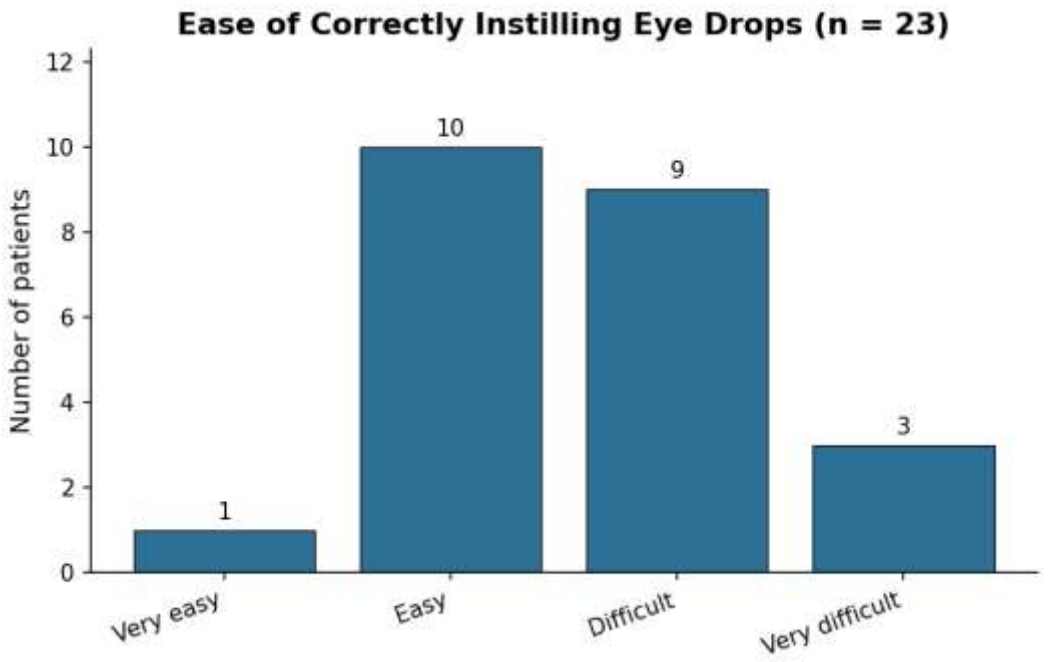


Figure 8. Patient-reported ease of correctly instilling eye drops (n = 23).

3.3.5 Accuracy: Missing the Eye When Instilling Drops

Regarding the frequency of missing the eye when applying drops, 12 patients (52.2%) reported this ‘sometimes’, 7 (30.4%) ‘often’, 2 (8.7%) ‘almost every time’, and only 2 (8.7%) ‘never’. This confirms that instillation technique is an important, frequently under-addressed practical barrier, as the large majority of patients (91.3%) miss the eye at least occasionally.

3.3.6 Remembering the Treatment Schedule

Difficulty remembering the schedule for putting in the drops was reported as occurring ‘sometimes’ by 11 patients (47.8%), ‘never’ by 6 (26.1%), ‘often’ by 5 (21.7%), and ‘always’ by 1 patient (4.3%).

3.3.7 Who Assists with Treatment

Slightly over half of patients (12/23, 52.2%) manage their treatment by themselves without assistance, while 10 (43.5%) are helped by a family member, and 1 (4.3%) reported receiving no help at all despite needing it.

3.4 Motivational and Economic Barriers

3.4.1 Cost-Related Treatment Interruption

A minority of patients (3/23, 13.0%) reported having had to stop or reduce their treatment because of its cost, while the large majority (20/23, 87.0%) had not experienced this barrier.

3.4.2 Discontinuation When Symptoms Improve

A clinically important finding is that 14 patients (60.9%: 21.7% ‘always’ + 21.7% ‘often’ + 17.4% ‘sometimes’) reported stopping treatment, at least occasionally, once their eye ‘feels better’, against 9 (39.1%) who reported never doing so. Since several of the conditions represented in this sample, glaucoma in particular, are asymptomatic or slow-progressing chronic diseases in which subjective improvement does not reflect the underlying disease course, this behaviour represents a major adherence risk.

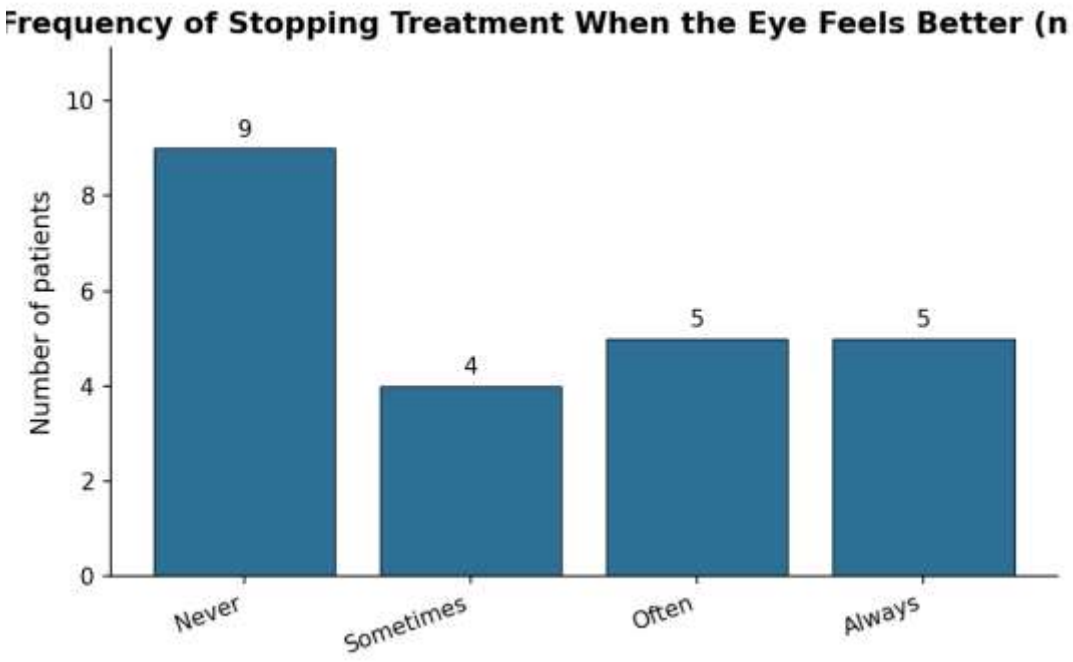


Figure 9. Frequency of stopping treatment when the eye feels better (n = 23).

3.4.3 Main Reason for Possible Discontinuation

When asked about the main reason that might lead them to stop using their drops, 10 patients (43.5%) cited simply forgetting, 8 (34.8%) cited the belief that their eye was fine, 3 (13.0%) cited having too many drops to manage, and single patients (4.3% each) cited a belief that the treatment does not help or that it causes pain.

3.4.4 Perceived Overall Difficulty of Daily Adherence

When asked to directly rate the difficulty of sticking to a daily drop regimen, responses were split almost evenly between 'difficult' (9/23, 39.1%) and 'somewhat easy' (9/23, 39.1%), with 3 patients (13.0%) reporting 'very difficult' and only 2 (8.7%) reporting 'very easy'. In total, over half of the sample (12/23, 52.2%) rated daily adherence as difficult or very difficult.

Table 6. Perceived Difficulty of Daily Adherence (n = 23)

Perceived difficulty of daily adherence	N	%
Very easy	2	8.7%
Somewhat easy	9	39.1%
Difficult	9	39.1%
Very difficult	3	13.0%

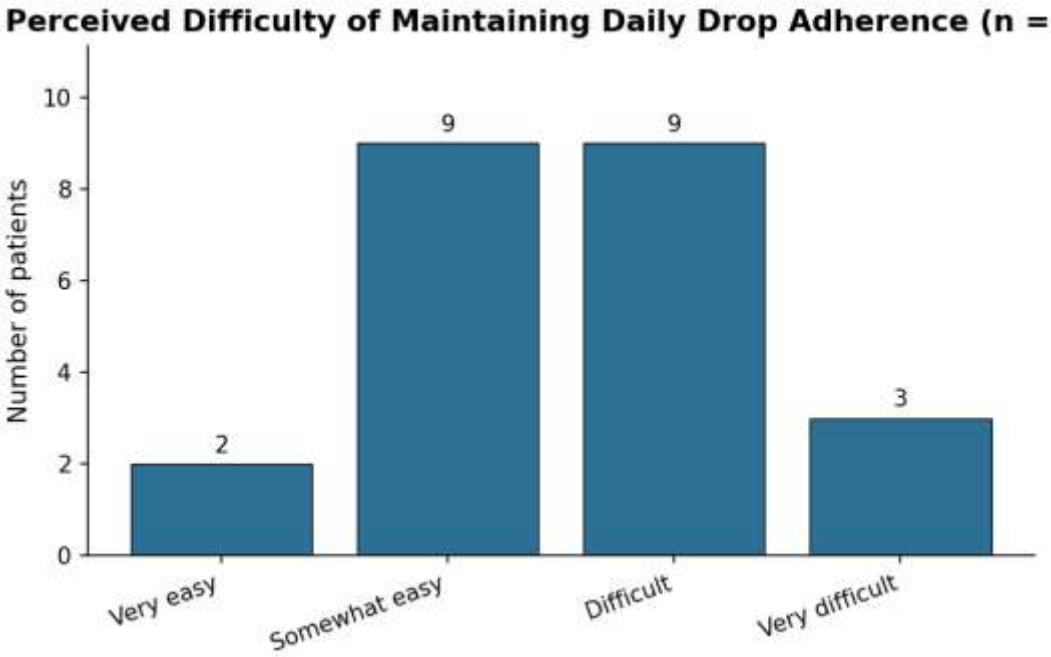


Figure 10. Patient-rated overall difficulty of maintaining daily drop adherence (n = 23).

3.5 Interest in Training and Prior Therapeutic Education Exposure

3.5.1 Interest in Receiving Instillation Training

Interest in receiving training on the correct instillation technique was high: 7 patients (30.4%) responded ‘yes, definitely’ and 8 (34.8%) responded ‘maybe’, together representing 65.2% of the sample expressing at least some interest, while 6 (26.1%) considered it ‘not necessary’ and 2 (8.7%) declined.

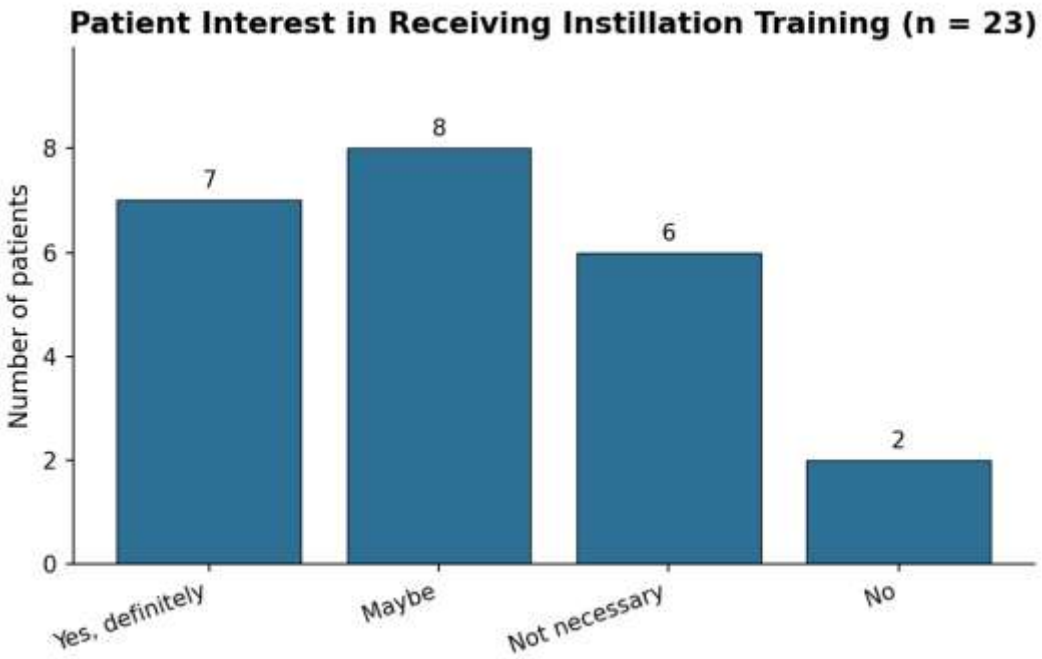


Figure 11. Patient interest in receiving training on correct eye-drop instillation (n = 23).

3.5.2 Prior Attendance of a Therapeutic Education (TPE) Session

The large majority of patients (17/23, 73.9%) reported never having attended a therapeutic education session about their eye condition. Only a small minority reported having attended one session (2/23, 8.7%) or several sessions (2/23, 8.7%), and 2 patients (8.7%) could not recall. This confirms a substantial gap in structured therapeutic patient education coverage within the studied population.

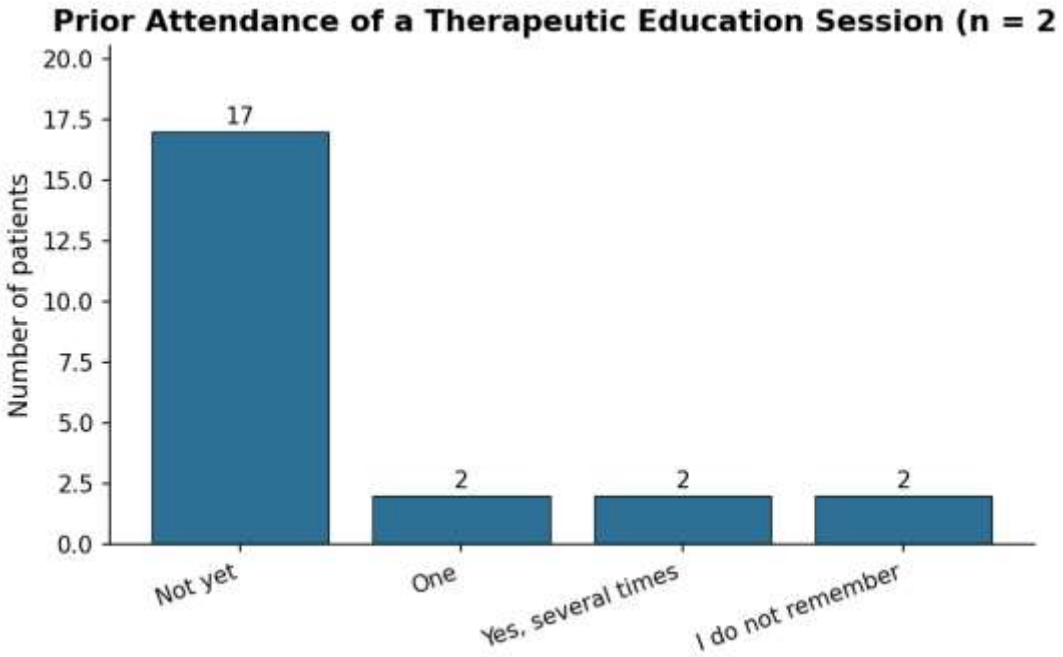


Figure 12. Prior attendance of a therapeutic education session on the ocular condition (n = 23).

3.5.3 Perceived Usefulness of Therapeutic Education Sessions

Among the responses collected for this item (see the data quality note in Section 2.5), 11 patients (47.8%) rated prior or hypothetical therapeutic education sessions as ‘somewhat useful’, 7 (30.4%) as ‘not very useful’, 3 (13.0%) as ‘very useful’, and 2 (8.7%) as ‘not useful at all’.

3.5.4 Recourse When Treatment Is Not Understood

When patients do not understand something about their treatment, 9 (39.1%) ask their doctor, 7 (30.4%) ask a family member, 6 (26.1%) search online, and 1 (4.3%) does nothing. Notably, over half of the sample (56.5%) turns to a source other than a healthcare professional (family or internet) when in doubt, which underlines a clear information gap that a validated, professionally-designed digital tool could help to fill safely.

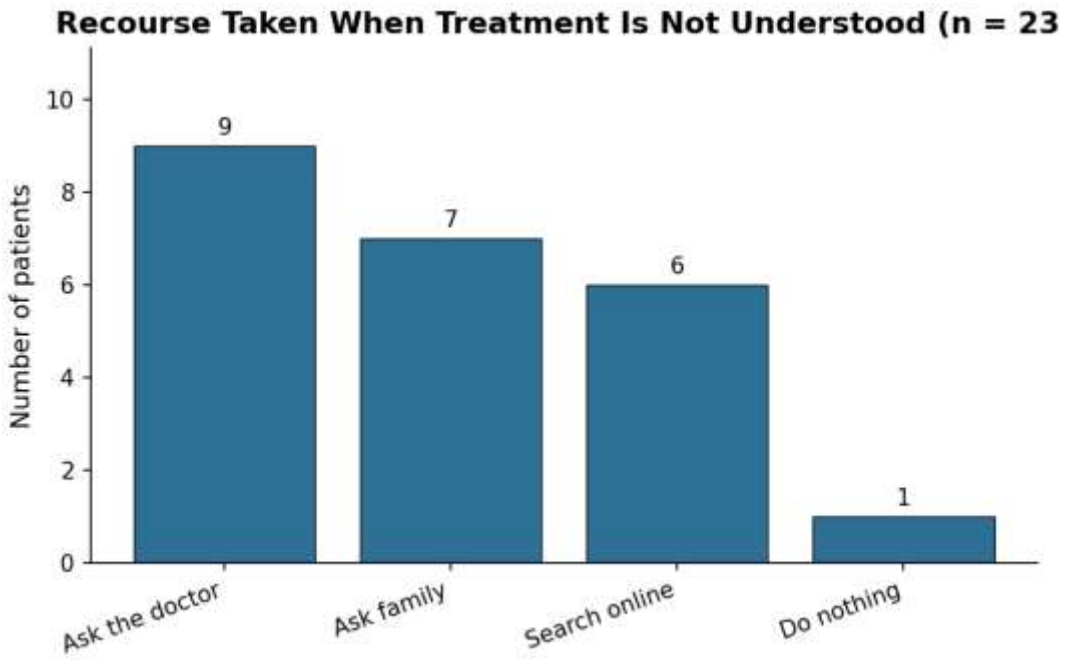


Figure 13. Recourse taken by patients when they do not understand an aspect of their treatment (n = 23).

3.6 Attitudes Toward a Digital Adherence-Support Application

The final item of the questionnaire asked patients whether they would like an application acting as a ‘patient follow-up assistant’, reminding them of the timing and method for using their drops and sending alerts in case of a forgotten dose. The response was overwhelmingly positive: 21 of 23 patients (91.3%) expressed interest in such an application, against only 2 (8.7%) who did not.

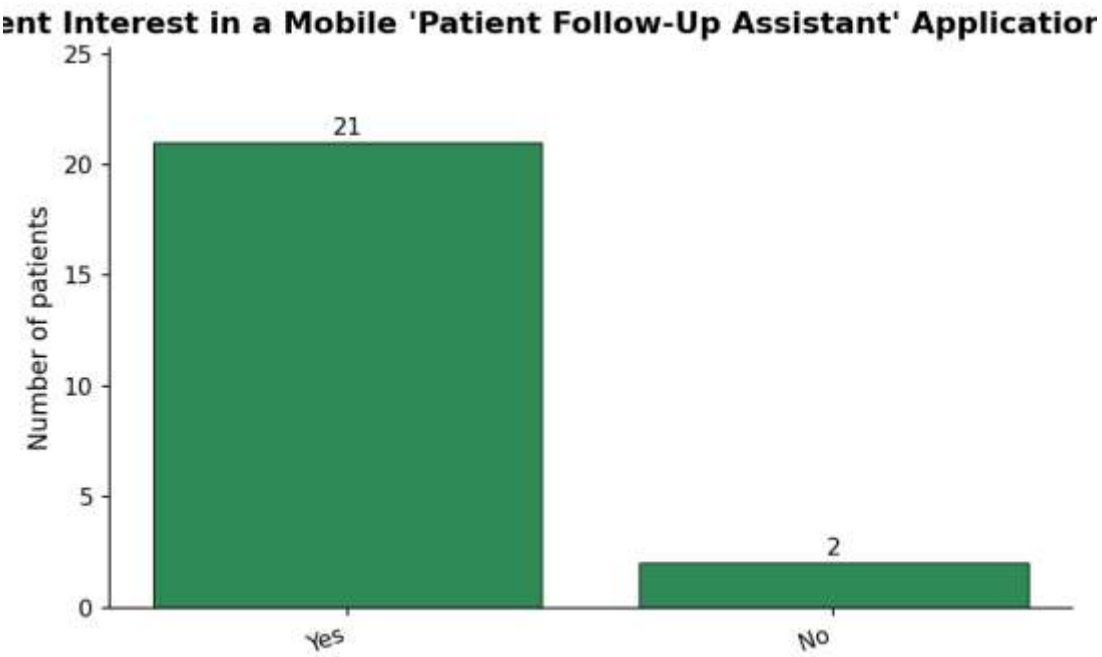


Figure 14. Patient interest in a mobile 'patient follow-up assistant' application (n = 23).

This result is central to the recommendations developed in Section 6, as it demonstrates a strong, pre-existing patient willingness to adopt a digital adherence-support solution, well above the levels of prior therapeutic education exposure (26.1%) or of confident treatment understanding (34.8%) documented elsewhere in this section.

4. Analysis and Interpretation

This section moves beyond the item-by-item description presented in Section 3 to interpret the results as a whole, in particular by cross-tabulating the main ocular condition with the principal adherence indicators, and by relating the different domains of the questionnaire (knowledge, behaviour, education, and attitude toward digital tools) to one another. Given the sample size (n = 23), these cross-tabulations are exploratory and descriptive; they are intended to generate hypotheses for the discussion rather than to establish statistically confirmed associations.

4.1 Glaucoma versus Cataract: A Contrasting Adherence Profile

Glaucoma (n = 8) and cataract (n = 9) together represent the two largest disease subgroups in the sample and offer a particularly informative contrast, since they differ sharply in their natural history: cataract in this sample largely reflects a time-limited post-operative drop regimen, whereas glaucoma requires a lifelong, often asymptomatic treatment aimed at preventing an irreversible complication (optic nerve damage) rather than at relieving a perceptible symptom.

This distinction is clearly reflected in the frequency of forgetting a dose. Among cataract patients, 6 of 9 (66.7%) reported 'never' forgetting a dose, compared with 0 of 8 glaucoma patients. Conversely, 6 of 8 glaucoma patients (75.0%) reported forgetting 'sometimes', compared with only 2 of 9 cataract patients (22.2%).

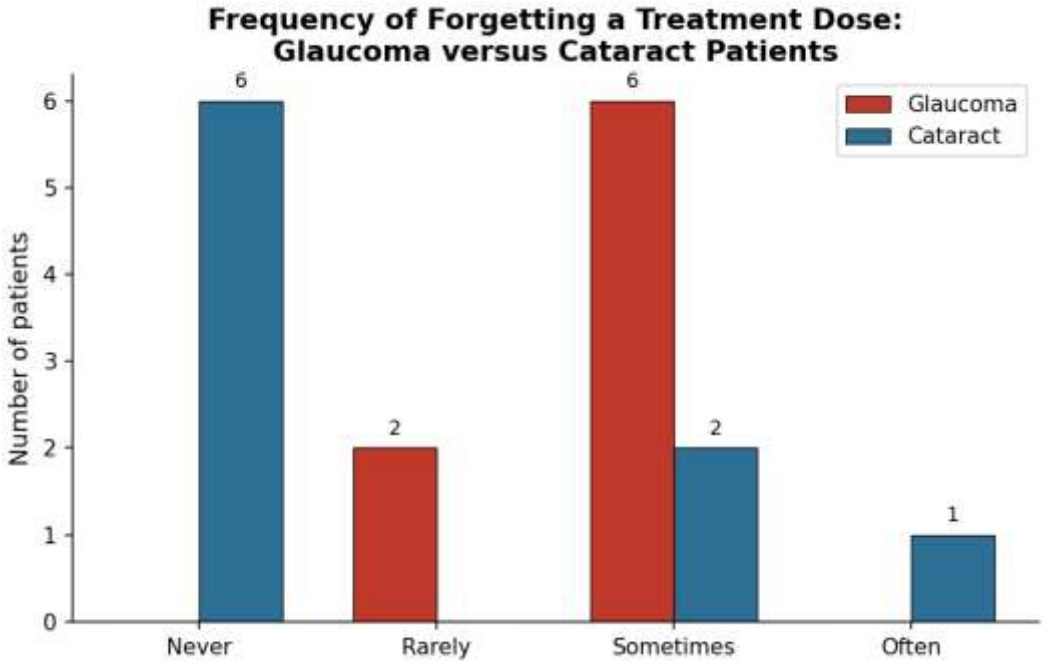


Figure 15. Frequency of forgetting a treatment dose, glaucoma versus cataract patients.

This pattern is consistent with the well-documented clinical observation that adherence tends to decline in the absence of perceived symptoms or perceived urgency: cataract patients typically follow a short, clearly bounded post-operative course with a visible and closely monitored recovery, which reinforces adherence, whereas glaucoma patients must sustain a treatment routine indefinitely, often without any subjective marker of disease activity or treatment benefit. This finding directly supports the concern already highlighted in Section 3.4.2, where 60.9% of the overall sample reported stopping treatment, at least occasionally, once they felt their eye had improved — a behaviour that is particularly dangerous in glaucoma, where visual field loss is silent and irreversible.

The two disease groups also showed comparable, high rates of difficulty with daily adherence and instillation technique (respectively 6/8, 75.0% and 5/9, 55.6% of glaucoma and cataract patients rating adherence as difficult or very difficult), suggesting that practical, hands-on barriers to instillation are shared across disease groups and are not specific to the chronic, asymptomatic nature of glaucoma. Interest in the proposed application was similarly high in both groups (7/8, 87.5% for glaucoma; 8/9, 88.9% for cataract), indicating that the intervention proposed in Section 6 is likely to be broadly acceptable regardless of the underlying ocular condition.

4.2 The Knowledge-Behaviour Gap

A recurring pattern across the results is a gap between the information patients say they received and what they retained or understood. While 91.3% of patients report that an ophthalmologist explained their condition to them, only 34.8% report understanding the purpose of their treatment ‘for sure’, and just 17.4% report knowing its possible side effects. This gap suggests that verbal explanation delivered during a routine consultation, however consistently provided, is on its own an insufficient vehicle for durable patient understanding, particularly for information as detailed as pharmacological side effects.

This interpretation is reinforced by the low rate of prior exposure to structured therapeutic patient education (only 26.1% of patients had ever attended a dedicated TPE session), despite the well-established evidence, presented in the theoretical section of this dissertation, that structured, multi-session TPE programmes are more effective than opportunistic verbal advice at improving both disease understanding and treatment adherence. The knowledge-behaviour gap identified here is therefore best explained not by a lack of clinical explanation, but by a lack of structured, reinforced, and practically-oriented education — precisely the gap that the mobile application proposed in Section 6 is designed to help close.

4.3 Instillation Technique as an Under-Recognised Barrier

A cross-analysis of the practical instillation items reveals a consistent pattern: 52.2% of patients rate instillation as difficult or very difficult, 91.3% report missing the eye at least occasionally, and 65.2% express interest in receiving formal training on the technique. Taken together, these figures indicate that the mechanical, hands-on aspect of treatment administration is at least as significant a barrier to adherence as the cognitive or motivational aspects more traditionally emphasised in adherence counselling. This is a frequently under-addressed dimension of therapeutic education in routine ophthalmology consultations, which tend to focus on verbal explanation of the disease rather than on hands-on demonstration of drop instillation.

4.4 Time Since Diagnosis and Adherence Patterns

An exploratory comparison of the mean time since diagnosis across the forgetting-frequency categories suggests a non-linear relationship: patients reporting 'never' forgetting had a mean disease duration of 2.4 years, while those reporting forgetting 'rarely' had a notably longer mean duration (10.7 years), and those reporting 'sometimes' forgetting averaged 4.9 years. Given the very small subgroup sizes involved (as few as 3 patients per category), this pattern should be interpreted with caution and is presented here only as a hypothesis-generating observation: it may suggest that a subset of long-term patients eventually develop stable, well-embedded routines, while adherence difficulties are more common in the initial years following diagnosis, when routines are still being established. A larger, longitudinal sample would be required to confirm this trend.

4.5 A Strong, Largely Untapped Willingness to Adopt Digital Support

Perhaps the most striking finding of this analysis is the contrast between the very high patient interest in a digital adherence-support application (91.3%) and the comparatively low levels of confident treatment understanding (34.8%), side-effect knowledge (17.4%), and prior therapeutic education exposure (26.1%). This gap indicates that patient demand for better support in managing their treatment considerably exceeds what is currently being offered through conventional educational channels, and that this demand is not confined to any particular disease subgroup, age profile, or level of prior difficulty; interest in the application was expressed consistently across patients who reported easy instillation and those who reported difficult instillation, and across patients with recent and long-standing diagnoses alike. This consistency across subgroups reinforces the case, developed in Section 6, for a broadly applicable rather than narrowly targeted application design.

4.6 Understanding of Treatment Purpose versus Perceived Adherence Difficulty

A cross-tabulation between patients' understanding of the purpose of their treatment and their perceived difficulty of daily adherence offers a further, tentative illustration of the knowledge-behaviour relationship discussed in Section 4.2. Among the 4 patients reporting that they did not understand the treatment's purpose ‘at all’, 3 (75.0%) nonetheless rated daily adherence as ‘somewhat easy’ or ‘very easy’, a somewhat counter-intuitive finding that may reflect the fact that a simple, repetitive drop regimen can be mechanically followed even without a clear grasp of its rationale, at least in the short term. Conversely, among the 6 patients reporting only ‘partial’ understanding, 5 (83.3%) rated daily adherence as ‘difficult’ or ‘very difficult’, the highest proportion of any understanding category.

While the small subgroup sizes again preclude firm conclusions, this pattern suggests that the relationship between understanding and adherence difficulty may not be strictly linear: partial, uncertain understanding, rather than a complete absence of understanding, could plausibly be associated with the greatest perceived difficulty, perhaps because patients in this intermediate group are aware enough of the treatment's importance to feel the weight of non-adherence, without possessing the confidence or knowledge needed to sustain it comfortably. This hypothesis, generated from a small sample, would be worth exploring in a larger, dedicated study, and reinforces the case for the ‘why this matters’ education module proposed in Section 6.3.2, which specifically targets this intermediate zone of partial understanding.

5. Discussion

5.1 Summary of Key Findings

This survey of 23 patients followed for chronic ophthalmic conditions, principally glaucoma and cataract, confirms several concerns already raised in the theoretical section of this dissertation regarding therapeutic adherence in ophthalmology. Three findings stand out. First, despite near-universal contact with an ophthalmologist for disease explanation (91.3%), objective and subjective indicators of understanding remain low, with only around one third of patients confidently understanding the purpose of their treatment and fewer than one in five aware of possible side effects. Second, adherence behaviours are frequently sub-optimal across several dimensions simultaneously: instillation technique (52.2% report difficulty), dosing regularity (65.2% report at least occasional forgetting), and treatment persistence (60.9% stop treatment, at least occasionally, once symptoms subjectively improve). Third, structured therapeutic patient education remains largely absent from the care pathway of these patients (73.9% have never attended a session), while patient demand for a digital adherence-support tool is very high (91.3%).

5.2 Interpretation in Light of Adherence Theory

These findings can be usefully read through the lens of the multidimensional adherence framework already introduced in the theoretical section of this dissertation, which distinguishes patient-related factors (health literacy, beliefs, motivation), condition-related factors (chronicity, symptom visibility), therapy-related factors (regimen complexity, administration technique), health-system factors (availability of structured education), and socio-economic factors (cost of treatment).

The results collected here map onto each of these dimensions. At the patient level, the low rate of confident treatment understanding and side-effect knowledge points to a health-literacy gap that likely interacts with motivation: a patient who does not understand why a treatment matters has less reason to persist with it once early, easily-tolerated side effects or simple daily fatigue set in. At the condition level, the glaucoma-cataract contrast documented in Section 4.1 illustrates a principle widely discussed in the adherence literature: asymptomatic, slow-progressing chronic conditions are systematically associated with poorer long-term adherence than acute or symptomatically-monitored conditions, because the perceived, immediate cost of treatment (time, discomfort, cost) is not offset by any perceptible, immediate benefit. At the therapy level, the very high rate of instillation difficulty (52.2%) and eye-missing (91.3% at least occasionally) confirms that regimen and administration complexity, not merely forgetfulness, are a major contributor to non-adherence in this population — a dimension that is sometimes under-

weighted relative to purely cognitive or motivational explanations of non-adherence. At the health-system level, the scarcity of structured therapeutic education sessions (only 26.1% of patients had ever attended one) is consistent with broader, well-documented gaps in the systematic deployment of therapeutic patient education programmes in ophthalmology compared with other chronic disease areas such as diabetes, where structured education is more institutionally embedded.

5.3 Why a Digital Tool May Address a Genuine, Currently Unmet Need

The very high level of interest expressed by patients in a mobile 'patient follow-up assistant' (91.3%) is a notable finding, both because of its magnitude and because it appears consistently across disease subgroups and across patients who report differing levels of practical difficulty. Read alongside the knowledge-behaviour gap discussed in Section 4.2 and the largely unmet demand for hands-on instillation training (65.2% interested, only a minority previously trained), this suggests that patients themselves perceive a gap between the support they currently receive and the support they feel they need — and that a well-designed digital tool, rather than being an add-on convenience, could function as a genuine extension of therapeutic patient education into patients' daily lives, where routine consultations cannot reach.

This is consistent with a broader trend, discussed in the theoretical section of this dissertation, toward the use of mobile health (mHealth) tools as adjuncts to in-person therapeutic education in chronic disease management: reminder systems, educational modules, and self-monitoring functionalities have shown promise in several chronic disease areas for reinforcing adherence between consultations, provided they are well integrated into the patient's routine and are not perceived as an additional burden.

5.4 Limitations of the Study

Several limitations of this survey must be acknowledged, and should temper the interpretation of the findings presented above.

- Sample size and representativeness: with only 23 respondents recruited through convenience sampling at a single or limited number of sites, the sample cannot be considered statistically representative of the broader population of ophthalmology patients. Several disease subgroups (pterygium, keratoconus, diabetic retinopathy) are represented by a single patient each, precluding any meaningful subgroup analysis for these conditions, which is particularly limiting given that diabetic retinopathy was one of the two index conditions of interest for this dissertation.
- Self-reported data: all adherence and knowledge indicators are based on patient self-report, which is well known in the adherence literature to be subject to social desirability bias —

patients may over-report adherence and under-report gaps in understanding relative to objectively measured behaviour (e.g. pharmacy refill data or electronic monitoring of drop bottles).

- Cross-sectional design: the single-point-in-time design does not allow the temporal or causal relationships suggested in Section 4.4 (e.g. between time since diagnosis and forgetting frequency) to be confirmed; a longitudinal design would be required for that purpose.
- Questionnaire administration and data quality: as noted in Section 2.5, the item on the perceived usefulness of therapeutic education sessions was answered even by patients who reported never having attended one, suggesting either a hypothetical response mode for this item or an imperfect branching logic in the electronic form; usefulness results for this item should therefore be interpreted with caution.
- Absence of an objective adherence measure: no objective or biological marker of adherence (e.g. intraocular pressure control in glaucoma patients, or electronic dose-monitoring) was incorporated, which would have allowed the self-reported findings to be triangulated against a more objective outcome.
- Single-instrument, non-validated questionnaire: the questionnaire used was developed specifically for this dissertation and, while grounded in the adherence domains discussed in the theoretical section, has not undergone formal psychometric validation (reliability or construct validity testing), which limits comparability with adherence scores derived from validated instruments used in other studies.

5.5 A Specific Note on Diabetic Retinopathy

Diabetic retinopathy was one of the two index conditions motivating this dissertation, alongside glaucoma, given its shared status as a chronic, potentially asymptomatic condition in which non-adherence can lead to irreversible visual loss. However, only a single respondent in this sample (4.3%) reported diabetic retinopathy as their main ocular condition, which severely limits any condition-specific interpretation for this group within the present dataset.

This under-representation is itself a noteworthy finding for the practical planning of future work: it suggests that diabetic retinopathy patients may be less readily reached through the recruitment channels used for this survey (largely direct ophthalmology follow-up visits), possibly because these patients are also, or primarily, followed within diabetology or endocrinology services, where ocular adherence questions may not be systematically raised. This observation supports a broader recommendation, complementary to those in Section 6, that future adherence surveys and any pilot deployment of the proposed application should deliberately include diabetology-linked recruitment pathways to ensure adequate representation of diabetic retinopathy patients, whose adherence challenges — combining ocular treatment with broader glycaemic

management — are likely to differ meaningfully from those of the glaucoma and cataract patients who dominate the present sample.

5.6 Consistency with the Theoretical Framework

Despite these limitations, the practical findings of this survey are broadly consistent with, and provide an empirical, local illustration of, the theoretical concerns developed earlier in this dissertation regarding the multifactorial nature of non-adherence in ophthalmology and the under-utilisation of structured therapeutic patient education in this specialty. The results reinforce the rationale, already outlined in the theoretical section, for developing and evaluating adherence-support interventions that combine educational, technical (instillation training), and motivational components — a rationale that directly informs the recommendations proposed in the following section.

6. Recommendations

Building on the results and interpretation presented in Sections 3 to 5, this section proposes a set of concrete recommendations aimed at improving therapeutic adherence among patients followed for chronic ophthalmic conditions. Recommendations are organised into three levels: clinical-organisational practice, therapeutic patient education, and a detailed proposal for a dedicated mobile application, which is the central practical contribution of this dissertation and directly responds to the strong patient demand documented in Section 3.6.

6.1 Clinical and Organisational Recommendations

- Systematise a brief, hands-on demonstration of eye-drop instillation technique at the time of prescription or diagnosis, rather than relying solely on verbal explanation, given that 52.2% of surveyed patients report instillation difficulty and 91.3% report missing the eye at least occasionally.
- Introduce a short, structured checklist for consultations with chronic ophthalmology patients, prompting the clinician to verify (not merely deliver) the patient's understanding of the treatment's purpose and possible side effects, addressing the knowledge-behaviour gap identified in Section 4.2.
- Actively offer structured therapeutic patient education sessions to newly diagnosed glaucoma and diabetic retinopathy patients, given that the current rate of prior TPE attendance in this sample (26.1%) remains far below what would be expected for conditions of this chronicity and severity.
- Pay particular clinical attention to the early years following diagnosis, which the exploratory analysis in Section 4.4 suggests may be a higher-risk period for inconsistent adherence, before routines are firmly established.

6.2 Recommendations for Therapeutic Patient Education Content

- Expand therapeutic education content beyond disease explanation to explicitly cover: the rationale for treatment continuation despite the absence of symptoms (directly addressing the 60.9% of patients who report stopping treatment when they feel better), the correct response to a forgotten dose (addressing the near-even, and partly incorrect, split observed in Section 3.3.2), and basic hygiene practices before instillation.
- Involve family members in therapeutic education where relevant, given that 43.5% of patients currently rely on a family member for treatment assistance.
- Where cost is identified as a barrier (13.0% of this sample), proactively discuss access to generic alternatives or available financial support mechanisms.

6.3 Proposed Mobile Application: "OptiSuivi" A Patient Follow-Up Assistant

The single most actionable recommendation arising from this study is the development of a dedicated mobile application designed to support daily adherence and reinforce therapeutic education for patients with chronic ophthalmic conditions. This recommendation responds directly to the questionnaire's final item, in which 91.3% of patients expressed interest in an application acting as a 'patient follow-up assistant.' The following subsections detail a proposed feature set, design principles, and implementation considerations, each explicitly justified by the survey findings presented above.

6.3.1 Core Objective

The proposed application, provisionally named 'OptiSuivi' ('Optical Follow-up'), is conceived not as a simple reminder tool but as a comprehensive digital extension of therapeutic patient education — bridging the gap, documented throughout this dissertation, between the explanation patients receive during consultations and the understanding, technique, and motivation they need to sustain adherence in their daily lives between visits.

6.3.2 Proposed Core Features

Table 7. Proposed Core Features of the OptiSuivi Application

Feature	Survey finding it addresses	Expected benefit
Personalised dosing reminders and alerts	65.2% forget a dose at least occasionally; near-even split on correct response to a missed dose (52.2% skip vs. 47.8% administer late)	Reduces missed and mismanaged doses through timed notifications and clear on-screen guidance for late doses
Step-by-step instillation guide (video/animation)	52.2% report instillation difficulty; 91.3% miss the eye at least occasionally; 65.2% want training	Improves technique and drug delivery accuracy without requiring an in-person visit
'Why this matters' education modules	Only 34.8% confidently understand treatment purpose; 60.9% stop when feeling better	Reinforces understanding of chronic, asymptomatic disease progression to reduce premature discontinuation
Side-effect information sheets	Only 17.4% know possible side effects	Provides validated, easy-to-access information, reducing reliance on unverified online searches (26.1% currently search online when in doubt)

Adherence self-tracking journal	Self-reported forgetting and instillation difficulty vary widely across patients	Allows patients and clinicians to visualise adherence patterns over time and identify at-risk periods (e.g. shortly after diagnosis, per Section 4.4)
Secure messaging link to the ophthalmology team	39.1% ask the doctor when in doubt, but 56.5% turn to family or the internet instead	Offers a fast, professionally validated channel for questions, reducing reliance on unverified sources
Family/caregiver companion access	43.5% of patients rely on a family member for treatment assistance	Allows a designated family member to receive reminders and track adherence alongside the patient
Cost and generic-alternative information	13.0% report treatment interruption due to cost	Signposts affordable alternatives and reduces cost-driven discontinuation

6.3.3 Design Principles

- Simplicity and accessibility: given that several respondents were older patients less familiar with digital tools, the interface should prioritise large text, high-contrast visuals, minimal required steps, and optional voice-guided instructions.
- Low burden: reminders and modules should be concise and infrequent enough to avoid becoming an additional source of fatigue, echoing the concern, raised in Section 5.3, that digital tools must integrate into routine rather than add to it.
- Clinical validation: all educational content should be reviewed and approved by the supervising ophthalmology team to ensure accuracy and to position the application as a genuine extension of, rather than a substitute for, professional therapeutic education.
- Data privacy: adherence and health data recorded within the application must be securely stored and processed in accordance with applicable data protection regulations, with clear patient consent for any data shared with the care team.
- Offline functionality for core reminder features, to ensure reliability regardless of internet connectivity, particularly relevant for older or rural patients.

6.3.4 Implementation Considerations and Feasibility

Prior to full-scale development, a staged approach is recommended. A minimal viable version focused on the two features most directly supported by the survey findings — dosing reminders and the instillation guide — could be piloted first among a small group of glaucoma and diabetic retinopathy patients, given the particularly high stakes of non-adherence in these two asymptomatic, sight-threatening conditions. Subsequent iterations could progressively introduce

the education modules, self-tracking journal, and secure messaging feature, informed by user feedback from the pilot phase.

Given the digital literacy concerns raised above, any pilot deployment should be accompanied by a brief, in-person onboarding session at the time of prescription, mirroring the hands-on training format that patients themselves requested (Section 3.5.1), so that the application is introduced as a natural continuation of the consultation rather than as a separate, unsupported tool.

6.3.5 Anticipated Evaluation Metrics

Should this application be developed and piloted, its impact could be evaluated using metrics that map directly onto the adherence indicators measured in this survey, allowing for a meaningful before-and-after comparison: self-reported frequency of forgetting a dose, self-reported ease of instillation, rate of premature treatment discontinuation, and patient-reported understanding of treatment purpose and side effects. Where feasible, this self-reported evaluation could be complemented by a more objective adherence indicator (e.g. intraocular pressure stability in glaucoma patients) to address the objective-measurement limitation noted in Section 5.4.

6.4 Illustrative Patient Personas

To ground the feature set described in Section 6.3.2 in realistic use cases, two illustrative personas are presented below, constructed from patterns observed across the anonymised survey responses. These personas do not correspond to any single respondent but synthesise recurring response combinations observed in the dataset, and are used here purely as a design and communication tool.

Persona 1 — "Ahmed," Newly Diagnosed Glaucoma Patient

Ahmed is in his early years of glaucoma treatment (consistent with the 56.5% of the sample diagnosed within the last two years). He reports understanding his treatment only partially, does not know its possible side effects, and forgets a dose 'sometimes'. He finds instillation somewhat difficult and has never attended a therapeutic education session, though he says he would welcome one. For Ahmed, OptiSuivi's greatest value lies in the reminder system, the instillation video guide, and the 'why this matters' education module explaining why glaucoma treatment must continue even when his eyes feel completely normal — directly targeting the discontinuation risk documented in Section 3.4.2 and Section 4.1.

Persona 2 — "Yasmine," Long-Standing Cataract Post-Operative Patient with Family Support

Yasmine is managing a short, defined post-operative drop regimen following cataract surgery. She rarely forgets a dose and finds instillation relatively easy, but relies on her daughter for help

remembering the schedule (reflecting the 43.5% of patients assisted by a family member). For Yasmine and her family, the companion access feature and shared reminders are the most relevant functionalities, allowing her daughter to stay informed without needing to be physically present at every administration time.

These two contrasting profiles illustrate why the application is designed around a modular feature set (Section 6.3.2) rather than a single, one-size-fits-all workflow: patients enter the adherence pathway with different needs depending on disease chronicity, prior knowledge, and available family support, and the application should allow individual features to be emphasised or de-emphasised according to the patient's profile, ideally following a short in-app onboarding questionnaire modelled on the domains identified in this dissertation's survey instrument.

6.5 Proposed Implementation Roadmap

A phased, three-stage roadmap is proposed to move from the current findings to a piloted, evaluated application, allowing risks to be identified and addressed incrementally rather than through a single, high-risk full launch.

Table 8. Proposed Implementation Roadmap for OptiSuivi

Phase	Main activities	Indicative duration
Phase 1 — Design and validation	Clinical content review by the supervising ophthalmology team; interface prototyping with attention to accessibility for older patients; validation of reminder and instillation-guide modules	2–3 months
Phase 2 — Pilot deployment	Onboarding of a small cohort of glaucoma and diabetic retinopathy patients with in-person introduction session; collection of usage data and adherence self-reports; iterative refinement	3–6 months
Phase 3 — Evaluation and scale-up	Comparison of pre- and post-pilot adherence indicators (Section 6.3.5); extension to additional disease groups (cataract, dry eye) and, if resources allow, additional clinical sites	6–12 months

6.6 Anticipated Risks and Mitigation Strategies

As with any digital health intervention, several risks should be anticipated and actively mitigated rather than treated as an afterthought.

- Digital exclusion of less tech-literate or elderly patients: mitigated through the simplicity-first design principle (Section 6.3.3), optional voice guidance, and mandatory in-person onboarding rather than a purely self-service rollout.
- Alert fatigue leading to reminders being ignored or disabled: mitigated by allowing patients to customise reminder frequency and by limiting non-essential notifications, in line with the 'low burden' design principle.
- Over-reliance on the application at the expense of in-person follow-up: the application should be explicitly positioned, in its own messaging and in clinician communication, as a complement to, not a replacement for, scheduled ophthalmology visits.
- Data privacy and security concerns, particularly given the sensitive nature of health data: addressed through secure data storage, minimal data collection, and transparent, explicit patient consent, as outlined in Section 6.3.3.
- Unequal access due to smartphone ownership or data costs: a factor not directly measured in this survey and flagged here as an important feasibility question to be assessed before large-scale deployment, potentially through a basic SMS-based reminder fallback for patients without a compatible smartphone.

6.7 Stakeholder Engagement

Successful development and adoption of the proposed application will require coordinated engagement from several stakeholder groups: the ophthalmology clinical team, who must validate content and integrate the tool into routine consultations; hospital or clinic administration, to support any necessary technical infrastructure and data governance arrangements; patients and, where relevant, family caregivers, whose feedback during the pilot phase (Section 6.5) should directly inform iterative design changes; and, if pursued beyond the pilot stage, a technical development partner with experience in secure, accessible mobile health application design.

6.8 Summary: From Findings to Recommendations

Table 9 below closes this section by mapping each major survey finding to its corresponding recommendation, making explicit the evidence-based rationale underlying the proposals developed throughout Section 6.

Table 9. Summary Mapping of Survey Findings to Recommendations

Survey finding (Section 3–4)	Corresponding recommendation (Section 6)
52.2% report instillation difficulty; 91.3% miss the eye at least occasionally	Hands-on demonstration at prescription (6.1); step-by-step instillation guide in OptiSuivi (6.3.2)
Only 34.8% confidently understand treatment purpose; 17.4% know side effects	Consultation checklist verifying understanding (6.1); education modules and side-effect sheets in OptiSuivi (6.3.2)
60.9% stop treatment when feeling better; sharp glaucoma vs. cataract contrast (4.1)	'Why this matters' education module explaining asymptomatic disease progression (6.3.2, 6.3.4)
65.2% forget a dose at least occasionally; near-even split on correct response to a missed dose	Personalised dosing reminders and clear missed-dose guidance (6.3.2)
73.9% never attended a therapeutic education session	Proactive TPE offer to newly diagnosed patients (6.2); OptiSuivi as a scalable extension of TPE (6.3.1)
56.5% turn to family or the internet rather than a professional when in doubt	Secure messaging link to the care team within OptiSuivi (6.3.2)
43.5% rely on a family member for treatment assistance	Family/caregiver companion access feature (6.3.2); persona 'Yasmine' (6.4)
13.0% report cost-driven treatment interruption	Cost and generic-alternative information in-app (6.3.2); proactive discussion of financial support (6.2)
91.3% express interest in a digital adherence-support application	Development and phased pilot of OptiSuivi (6.3–6.5), directly responding to expressed patient demand

6.9 Illustrative Description of Key Application Screens

To make the feature set described above more concrete, this subsection narratively describes four illustrative screens envisioned for the OptiSuivi application. These descriptions are conceptual and intended to guide future interface design work; no interactive prototype was built as part of this dissertation.

Screen 1 — Daily Reminder Home Screen. The home screen displays the day's remaining drop administrations as a simple, large-icon checklist, with the next scheduled time shown prominently. A single tap marks a dose as administered; a differently coloured icon indicates a missed dose, which then triggers the guidance described in Screen 3. This design directly targets the 65.2% of surveyed patients who report at least occasional forgetting (Section 3.3.1).

Screen 2 — Instillation Guide. Accessible from the home screen at any time, this screen presents a short, step-by-step illustrated or video sequence demonstrating correct hand positioning, eyelid retraction, and drop placement, along with a brief hygiene reminder (handwashing before instillation). This screen responds directly to the 52.2% of patients reporting instillation difficulty and the 65.2% expressing interest in formal training (Sections 3.3.4 and 3.5.1).

Screen 3 — Missed Dose Guidance. When a dose is marked as missed or is not confirmed within a defined time window, this screen presents simple, clear guidance on the appropriate action (e.g. administering the dose as soon as remembered versus waiting for the next scheduled time, depending on the specific medication), directly addressing the near-even and partly inconsistent split observed in Section 3.3.2 regarding how patients currently handle a forgotten dose.

Screen 4 — 'Why This Matters' Education Card. Presented periodically, and always available on demand, this screen offers short, plain-language explanations of why continued treatment matters even in the absence of symptoms, tailored to the patient's specific condition (glaucoma, diabetic retinopathy, cataract, or other). This screen is the application's direct response to the central concern raised in Sections 3.4.2 and 4.1: that 60.9% of patients report stopping treatment, at least occasionally, once they feel their eye has improved, a behaviour with particularly serious consequences in asymptomatic, chronic conditions.

Conclusion

This practical component of the dissertation set out to assess the level of therapeutic adherence among patients followed for chronic ophthalmic conditions, with particular attention to glaucoma and diabetic retinopathy, and to explore patients' openness to a digital adherence-support tool. Based on 23 questionnaire responses, the findings reveal a consistent and coherent picture: while patients report almost universal contact with an ophthalmologist for disease explanation, their actual understanding of treatment purpose and side effects remains limited; adherence is undermined simultaneously by practical instillation difficulties, occasional forgetting, and premature discontinuation once symptoms subjectively improve; and structured therapeutic patient education remains largely absent from the care pathway of the patients surveyed.

The comparison between glaucoma and cataract patients illustrated, in a small but informative way, a broader principle central to this dissertation: adherence is most fragile precisely in the asymptomatic, chronic conditions where its consequences are most severe and least reversible. This underscores the importance of therapeutic patient education strategies that are tailored not only to the disease itself, but to its perceived, day-to-day salience in the patient's life.

At the same time, this study identified a clear and, at 91.3%, remarkably strong patient willingness to engage with a digital adherence-support application — a willingness that considerably exceeds current levels of therapeutic education coverage and treatment understanding. This gap between demand and current provision constitutes the central practical opportunity highlighted by this dissertation. The proposed application, OptiSuivi, translates each major finding of this survey into a concrete, justified feature, and is presented not as a stand-alone technological fix, but as a natural extension of the therapeutic patient education principles developed in the theoretical

section of this dissertation, designed to reach patients in the spaces between consultations where adherence is ultimately won or lost.

Naturally, the limitations discussed in Section 5.4 — most notably the modest, non-representative sample size and the reliance on self-reported measures — mean that these findings and the resulting recommendations should be regarded as a preliminary, hypothesis-generating contribution rather than a definitive assessment. Future work building on this dissertation could usefully extend the survey to a larger, multi-centre sample with a more balanced representation of diabetic retinopathy patients, incorporate objective adherence measures, and, ultimately, evaluate a piloted version of the proposed application against the adherence indicators established here. Such a trajectory would allow the promising signal identified in this study — a patient population that is under-informed and imperfectly adherent, yet strikingly receptive to digital support — to be translated into a measurable improvement in long-term visual outcomes for patients with chronic ophthalmic disease.

Annex A — Questionnaire Used for Data Collection

The following 21 items constitute the full self-administered questionnaire used for data collection, in addition to an initial timestamp automatically recorded upon submission. The questionnaire was administered electronically; response options for each item were presented as a single-choice list (examples of response categories are given in Section 3 alongside each result).

1. How long has it been since your eye condition was diagnosed (in years)?
2. What is your main eye disease?
3. Who mainly explained your eye disease to you?
4. Can you explain the purpose of your eye drops or treatments?
5. Do you know the possible side effects of your eye medications?
6. How often do you forget to take a dose of your medication?
7. What do you do if you forget to put in your eye drops?
8. Do you follow hygiene rules before putting in eye drops?
9. Who helps you with the treatment if you find it difficult to put in the drops?
10. Have you ever had to stop or reduce your treatment because of its cost?
11. Do you find it easy to correctly instill the drops into your eye?
12. How often do you miss your eye when putting in the drops?
13. Do you find it difficult to remember the schedule for putting in the drops?
14. Do you stop using the drops when your eye feels better?
15. What is the reason that might make you stop using the drops?
16. How do you rate the difficulty of sticking to using drops daily?
17. Would you like to receive training on how to correctly put in eye drops?
18. Have you ever attended a therapeutic education session about your eye condition?
19. How useful were these sessions for you?
20. When you don't understand something about your treatment, what do you do?
21. Would you like an app that works as a 'patient follow-up assistant', reminding you of the times and methods for using your drops, and sending alerts when you forget?

Note: this questionnaire was designed specifically for this dissertation and has not undergone formal psychometric validation; see Section 5.4 for a discussion of this limitation.

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Abstract (Practical Section)

Background. Therapeutic adherence remains a major determinant of long-term visual outcomes in chronic ophthalmic conditions such as glaucoma and diabetic retinopathy, both of which can progress silently toward irreversible visual loss when treatment is inconsistently followed. Building on the theoretical framework developed earlier in this dissertation, the practical section reported here aimed to describe the current level of therapeutic adherence, treatment-related knowledge, and prior exposure to therapeutic patient education (TPE) among a sample of ophthalmology patients, and to assess their receptiveness toward a mobile application designed to support daily adherence.

Methods. A structured, 21-item, self-administered questionnaire covering clinical background, health literacy, adherence behaviours, motivational and economic barriers, and attitudes toward a digital adherence-support tool was distributed to adult patients under active follow-up for a chronic ophthalmic condition. Responses were collected electronically between November 2025 and February 2026 and analysed descriptively, with cross-tabulation between the main ocular condition and key adherence indicators.

Results. Twenty-three valid responses were analysed, predominantly from patients with cataract (39.1%) and glaucoma (34.8%). While 91.3% of patients reported that an ophthalmologist had explained their condition, only 34.8% confidently understood the purpose of their treatment and 17.4% knew its possible side effects. Instillation difficulty was reported by 52.2% of patients, at least occasional forgetting by 65.2%, and treatment discontinuation upon subjective improvement by 60.9%. Only 26.1% had ever attended a structured TPE session, whereas 91.3% expressed interest in a mobile ‘patient follow-up assistant’ application. Glaucoma patients reported markedly more frequent forgetting than cataract patients, consistent with the asymptomatic, lifelong nature of glaucoma treatment.

Conclusion. This survey identifies a coherent pattern of incomplete treatment understanding, multi-dimensional adherence difficulty, and limited structured education, contrasted with a strong, broadly shared patient willingness to adopt digital adherence support. These findings support the development of a dedicated mobile application, proposed in this dissertation under the name OptiSuivi, as a concrete, patient-informed response to an identified and currently unmet need in the therapeutic education pathway of ophthalmology patients.

Keywords: therapeutic patient education; treatment adherence; ophthalmology; glaucoma; diabetic retinopathy; mobile health; mHealth; patient questionnaire.