

Pasi Hiukka

**OPTOMETRISTS AS PRIMARY EYE CARE PROVIDERS AND THEIR ROLE AS
CLINICAL EYE HEALTH ASSESSORS IN FINLAND**

Case Study

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ABSTRACT

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Purpose: This study aims to demonstrate that Finnish optometrists have the skills to act as primary eye care providers and that the current state of eye healthcare in Finland requires a new division of labour to meet the healthcare challenges of an ageing population.

Methods: This clinical case study aims to describe the assessment and symptom-based management of a 73-year-old Caucasian female examined by an optometrist at the optician shop in March 2023. In this clinical study, an optometrist is acting as a primary examiner in an eye health problem, which is discussed using evidence-based literature. The literature describes the level of Finnish optometry compared to Sweden, Norway, and Europe and the state of Finnish healthcare, particularly eye healthcare. The regional example used in the evidence-based literature is the Wellbeing Services County of Lapland. Due to the subject matter, most of the material used in the literature was searched from national grey literature sources in May 2023 using Google, Pubmed and Google Scholar. This was a single case study, and the researcher collected all data anonymously on-site while the patient was seen at the practice. Therefore, a separate IBR approval was not needed. This project was done for the Finnish Association of Vision and Eyecare (NÄE Ry). The partner was Brillet, where the examinations were carried out.

Results: In the clinical case study, the optometrist was able to get the patient quickly to the examination and, with the help of his skills and OCT scan, was able to diagnose the condition to the level of suspicion and, by consulting an ophthalmologist, was able to get the patient the further treatment she needed. As this clinical case and the evidence-based literature show, the skills and training of optometrists are quite high compared to other European countries. In Finland, laws restricting the activities of optometrists, restrictions on the prescription of spectacles, and the lack of referral rights limit the possibilities for developing eye care. Healthcare organizations, particularly eye care organizations, face significant challenges that must be addressed through a new eye care strategy and division of labour between eye care professionals. Without this, the growing challenges of an ageing population cannot be met without a deterioration in the quality and quantity of public eye care services. In Lapland, the large and sparsely populated area poses challenges for the organization of publicly funded services.

Conclusions: Optometrists, with their expertise and research equipment, can act as primary eye health professionals and also in acute cases, allowing for a new division of labour between the different professions in eye health care. The study suggests this would free up ophthalmologists' resources for managing complex eye diseases and surgery. At the same time, an area of eye care currently missing from primary healthcare in Finland could be created. This would be a cost-effective approach, saving on the cost of eye care and allowing services to be provided close to the patient. Due to long distances, sparse population, and limited public eye care services in Lapland, the new division of eye healthcare professionals should be piloted.

Keywords: optometrist, ophthalmologist, healthcare, eye healthcare, social welfare and healthcare reform, wellbeing services county,

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1 INTRODUCTION

This thesis presents a literature review of the state of optometry in Finland. It compares it with the European level and, in particular, with the level of optometry in Sweden and Norway. The thesis presents Finnish optometric education and national legislation on optometry. Opticians and optometrists are licensed healthcare professionals and work mainly in optician shops, which are licensed private healthcare providers. Thus, opticians, optometrists and optician shops are subject to the same laws as other health professionals such as nurses, physicians, and private medical practices.

The Decree on Health Care Professionals (564/1994) restricts opticians and optometrists' independent prescription of spectacles, contact lenses and low vision aids. According to the law, an optician/optometrist may not independently prescribe spectacles to a person who has or is suspected of having an eye disease, has had a surgical operation on his eyes or is under eight years old. This poses significant practical challenges to the appropriate allocation of work among eye care professionals, as many people who need eyeglasses have to go to an ophthalmologist's examination to obtain a prescription. In addition, Finnish opticians and optometrists lack the right to refer patients to specialist care on the public side. As a result, the resources of private ophthalmologists have to be used for procedures that opticians and optometrists can do because of their training and skills. Removing these constraints would clarify the division of labour between eye care professionals.

Healthcare is challenging due to an ageing population and an increasing dependency ratio. The Social Welfare and Healthcare Reform entered into force on 1 January 2023. It aims to help overcome these challenges. The challenges in eye healthcare are accentuated because the prevalence of the most common eye diseases increases with ageing, and there are no public eye care services in our country at the primary healthcare level.

The study will demonstrate the need, means and benefits of a new strategy for eye care and a new division of labour between eye care professionals.

Through a clinical case study, the thesis will demonstrate how an optometrist can intervene in diagnosing and managing an acute eye health condition. The optometrist can act as a primary eye care provider.

The author has been working as an optician and optometrist in Rovaniemi since 1997 and, with his experience, is familiar with the challenges in healthcare in Lapland, especially in eye care. The study suggests a possible solution to those challenges, which requires a new strategy for eye healthcare and a new division of labour between the professions in eye healthcare.

2 THEORETICAL BACKGROUND

2.1 What is Optometry?

World Council of Optometry (WCO) has created a concept of optometry: "Optometry is a healthcare profession that is autonomous, educated and regulated (licensed/registered), and optometrists are the primary healthcare practitioners of the eye and visual system who provide comprehensive eye and vision care, which includes refraction and dispensing, detection/diagnosis, and management of disease in the eye, and the rehabilitation of conditions of the visual system." The concept was developed in Paris in 1992 and accepted in Venice in 1993. (Kiely & Chappell 2005)

2.2 Profession of Optometrist

The profession of optometry is regulated in a variety of ways around the world. Unfortunately, in many countries, there is no regulation at all. This lack of regulation allows untrained people to work as optometrists, undermining the quality of vision and eye care. (WCO 2023)

European Council of Optometry and Optics (ECOO) has announced the fourth edition of the ECOO Blue Book 2020. The Blue Book aims to gather data on the number of optometrists and opticians, the scope of competence of those professionals, and information about the regulatory and educational environment. It provides a unique snapshot of the professions across Europe. The publication compiles data from nine other European countries and the 22 ECOO Member States. ECOO announced Blue Book earlier in the years 2008, 2015 and 2017. According to the latest ECOO Blue Book 2020, only in Poland, Bulgaria, and Estonia is optometry not regulated by law, and in the latter two countries, the legislative process is ongoing. The optometrist profession is protected in most of the countries surveyed. Only in seven out of 31 countries (Belgium, Bulgaria, Estonia, Italy, North Macedonia, Malta and Poland) is the profession not protected by law. (ECOO 2020)

World Council of Optometry (WCO) published A Global Competency-Based Model of the Scope of Practice in Optometry in 2005. It is based on a model developed by the Optometrists Association Australia (nowadays Optometry Australia) for minimum qualification requirements at different levels of optometry. The model is a four-level model. It aims to compare the level of optometry in different countries, facilitate the movement of

labour from one country to another and harmonize training in optometry and optics worldwide. (Kiely & Chappell 2005).

There are four categories in the model;

1. *Optical Technology Services: Management and dispensing of ophthalmic lenses, ophthalmic frames and other ophthalmic devices that correct visual system defects.*
2. *Visual Function Services: Optical Technology Services, plus investigation, examination, measurement, diagnosis and correction/management of defects of the visual system.*
3. *Ocular Diagnostic Services: Visual Function Services, plus investigation, examination and evaluation of the eye and adnexa and associated systemic factors, to detect, diagnose and manage the disease. Category 3 is divided into two parts: Without and With diagnostic drugs.*
4. *Ocular Therapeutic Services: Ocular Diagnostic Services, plus the use of pharmaceutical agents and other procedures to manage ocular conditions/disease.*

In the future, the model may be added a Category 5, which is the level at which optometrists are already qualified in some states in the United States. At this level, the scope of practice of an optometrist includes minor surgery, laser procedures and injections. (Kiely & Chappell 2005).

TABLE 1. WCO categories of optometric services. (Kiely & Chappell 2005)

| 1. Optical Technology Services | 2. Visual Function Services | 3. Ocular Diagnostic Services | | 4. Ocular Therapeutic Services |
|--------------------------------|-----------------------------|-------------------------------|---|---|
| | | without drugs | with drugs | |
| Optician | Optician | Optometrist | Optometrist | Optometrist |
| dispensing | dispensing | dispensing | dispensing | dispensing |
| | refraction | refraction | refraction | refraction |
| | prescription | prescription | prescription | prescription |
| | | screening for eye disease | diagnosis for eye disease using DPA's (diagnostics) | diagnosis for eye disease using DPA's (diagnostics) |
| | | | | treatment of eye disease using TPA's (therapeutics) |

Those eye care professionals in categories one and two are opticians, and those in the other categories may use the professional title of an optometrist. (Kiely & Chappell 2005)

According to the ECOO Blue Book 2020, in 48 % (15/31) of the countries surveyed, optometrists are in Category 3 or 4. For example, all the Nordic Countries included in the survey, Denmark, Finland, Norway, and Sweden, are in level 3 and only in Denmark are optometrists not allowed to use diagnostic drugs in their examinations. The United Kingdom is the only European country in Category 4. (ECOO 2020)

2.3 Optometric Education in Europe

Bachelor's Degree training is available for optometrists in 23 (74 %) European countries out of the 31 participating countries in the ECOO Blue Book 2020 -study. Master's degree training is available in 15 (48 %) countries, and PhD degree training is available in 11 (35 %) countries. In Sweden and Norway, for example, it is possible to study optometry up to PhD level. (ECOO 2020)

European Union has published the so-called Bologna Process, which aims to harmonize European higher education and facilitate the mobility of students and the more highly qualified workforce within the European Union. Another main objective of the Bologna Process is to make higher education more attractive throughout Europe and thus increase the educational interest of the population. The EHEA process

“introduced a three-cycle higher education system consisting of Bachelor's, Master's and doctoral studies”. (EHEA 1999)

The level of optometry and optics in terms of training and legislation varies widely across Europe. As a result of this difference in levels, European optometric training is evaluated by the European Council of Optometry and Optics (ECOO), which has created a model for the accreditation of optometric training institutions. Accreditation is based on the Bologna Process. One of the main objectives of accreditation is to harmonize European training in optometry and optics. This will allow optometry training programmes to be compared to agreed international standards, the European Diploma in Optometry and European Qualifications in Optics. The European Diploma has been defined as the golden standard in optometry and optics. It corresponds to the third level of A Global Competency-Based Model of WCO. The European Diploma establishes the competence, knowledge, skills and portfolio required in optometry. Accreditation provides tools to develop optometric education and national legislation, and it is a recognition of high quality, high standards of education. (ECOO 2015)

Optometrists who have graduated from ECOO-accredited universities can graduate with a European Diploma in Optometry (EDO). There are currently five fully accredited optometry training institutions in Europe. In addition, there is one accredited optic training institute in Vienna. Two institutions are partially accredited, one of which is Metropolia University of Applied Sciences in Helsinki. These two institutions have passed the first two but still have a third to complete. This component mainly includes the level of clinical competence and the extent of practical competence the student can achieve. (ECOO 2023)

TABLE 2: Accredited optometric training institutes in Europe (ECOO 2023)

| Accredited programmes for the European Diploma in Optometry | | |
|---|--------------------------|--|
| Fachhochschule Nordwestschweiz, Hochschule für Technik, Institut für Optometrie | Olten, Switzerland | Bachelor of Science FHNW in Optometry |
| University of South-Eastern Norway | Kongsberg, Norway | Bachelor in Optometry Master in Optometry and Visual Sciences |
| Beuth University | Berlin, Germany | Bachelor Course Augenoptik/Optometrie |
| University of Applied Sciences Utrecht | Utrecht, the Netherlands | Bachelor Programme: Optometrie |
| Karolinska Institutet | Stockholm, Sweden | BSc in Optometry MSc in Optometry |
| Accredited programmes for the European Qualification in Optics | | |
| OHI GmbH, Optometrie & Hörakustik Initiative | Vienna, Austria | Preparatory Course for the Final Apprenticeship in Eye Optics |
| Accredited programmes for Parts A and B of the European Diploma in Optometry | | |
| Metropolia University of Applied Sciences | Helsinki, Finland | Bachelor of Health Care (Optometry) |
| Institut des Sciences de la Vision | Saint-Etienne, France | Bachelor's and Master's Degrees in Optometry |

2.4 Optometry in Finland

The history of Finnish optics and optometry goes back to the 1850s when Johan Wallman was the first to use the name optician in Finland. Wallman was appointed the university optician, which gave him the right to import optical and other instruments to Finland. He was the only optician in Helsinki until the early 1880s. (Raustela 1991, 14)

From the 1850s to the present day, the optical trade and optometry, like the rest of society, have changed significantly. From being craftsman opticians of yesteryear who made spectacles by hand, they have become licensed healthcare professionals optometrists. In decades past, the main job of an optician was to make spectacles, whereas today, an optometrist's job is to examine and treat vision and eye health.

2.4.1 Legislation and Guidance on Optometry in Finland

The Act on the Optician Practice entered into force in Finland on June 1st 1961. This date can be considered a significant milestone in developing the optician profession in Finland. Since that day, opticians have been a legalized healthcare profession. An optician's name and position may only be used by someone who has completed studies leading to legalization. Furthermore, according to the 1961 law, Finnish opticians and optometrists are not authorized to independently prescribe eyeglasses to someone under sixteen who has suspected eye disease, has undergone eye surgery, or whose visual acuity is not normal with spectacles (Raustela 1991, 209).

Lääkintöhallitus (Medical Board) granted permission to fit independently contact lenses in 1980. At the same time, opticians were allowed to fit aids for visually impaired persons. The right-to-fit contact lenses and visually impaired aids require separate training. In 1989, the Finnish Parliament changed the age limit for the independent prescription of spectacles to eight years. (Raustela 1991, 211)

1994 The Health Care Professionals Act in Finland was published (Act of the Health Care Professionals 559/1994). The most significant improvement compared to The Act on the Practice of the Optician posted in 1961 was allowing opticians to prescribe contact lenses independently. The same amendment included the restrictions on the optician's independent right to prescribe spectacles, which had already been written into The Act on the Optician Practice (1961). The only exception to the original law was the eight-year age limit set in 1989. (Valtioneuvoston Asetus Terveystenhuollon Ammattihenkilöistä 564/1994)

A decree of the Finnish Government amended the 1994 Act on Health Care Professionals in 2010. The regulation gave opticians a restricted right to prescribe and use diagnostic drugs (Valtioneuvoston Asetus Terveystieteiden ammattihenkilöistä 433/2010). Opticians can use oxybuprocaine hydrochloride to anaesthetize the eye's anterior and short-acting mydratics to dilate the pupil (Sosiaali- ja terveysministeriön Asetus Lääkkeen määräämisestä 1088/2010). Adequate training is required for access to use diagnostic drugs. Training can be obtained through additional training (Valtioneuvoston Asetus Lääkkeen määräämisen edellyttämästä Koulutuksesta 1089/2010). Nowadays, graduating optometrists have training in using diagnostic medications in their primary studies (Oulu University of Applied Sciences 2022a).

Only physicians can refer patients to a public hospital in Finland (Act on Specialized Health Care 1062/1989). Due to legislation, an optometrist can only recommend a patient to go to an ophthalmologist if there is any suspected eye disease in the patient's eyes. In this case, the most common way is to go to a private ophthalmologist, and then the patient pays for the examination her-/himself. The other way for a patient is to go to a public health care centre to see a general medical doctor who can refer them to the public eye clinic.

Like other healthcare professionals, opticians are regulated by the Act on Health Care Professionals (559/1994), which defines all licensed healthcare professionals and their rights and responsibilities. As written in Article 2 of the Act, a healthcare professional is

(1) a person who, on the basis of this Act, has been given the right to practice a profession (licensed professional) or the authorization to practice a profession (authorized professional) and (2) a person who, on the basis of this Act, is entitled to use the occupational title of a healthcare professional as laid down by Government decree (professional with a protected occupational title) (1200/2007) (Act of the Health Care Professionals 559/1994).

Furthermore, section 15 of Chapter 3 of the Act provides for the professional ethics of healthcare professionals as follows:

The aim of the professional activities of healthcare professionals is to promote and maintain health, prevent illness, cure those who are ill, and alleviate their suffering. In their professional activities, healthcare professionals must employ generally accepted, empirically justified methods in accordance with their training, which should be continually supplemented. Each healthcare professional must weigh the benefits of their professional activity to the patient and its possible hazards. Healthcare professionals must take account of the provisions concerning patients' rights.

Healthcare professionals must always provide help to those in need of urgent care. (Act of the Health Care Professionals 559/1994)

The Act on Health Care Professionals also lays down provisions on, among other things, the recording, storage, and confidentiality of patient data, the obligation to take part in further training and the guidance and supervision of healthcare professionals. The Act also contains disciplinary and punitive provisions for breaches of its orders. (Act of the Health Care Professionals 559/1994).

Optical shops provide the majority of optical services in Finland. It is also common for optical stores to offer services provided by ophthalmologists. When an optical store provides services of a licensed healthcare professional, it must apply for a licence for its healthcare-related activities. Once licensed, the optical store is a private healthcare provider whose operations are regulated by the Act on the Supervision of Social Welfare and Healthcare. This law defines the general conditions for the service provider's operation, trustworthiness verification, premises, operating environment, equipment, patient data system, and staff. The law also provides for self-monitoring by service providers, supervision by the authorities and sanctions for non-compliance. The license to provide healthcare services is issued by the Regional State Administrative Agency (AVI), whose territory the company operates. If the company operates in a broader area, the authorization is granted by The National Supervisory Authority for Welfare and Health (Valvira). (Laki Sosiaali- ja Terveystieteiden Valvonnasta 741/2023)

Service providers are registered to Valveri, a register maintained by Valvira, and are responsible for ensuring that the information in Valveri is up to date. In January 2024, Valveri will be replaced by Soteri, a digital public register and information service for all social and healthcare providers. With Soteri, authorization and registration processes will be digitalized, making it easier and faster for service providers and public authorities to manage their work. (Soteri 2023)

The Social Insurance Institution of Finland (KELA) maintains a national patient data system, the Kanta. All healthcare providers must register with this service, where all medical records of examinations carried out by healthcare professionals using the digital health record system must be recorded. (Laki Sosiaali- ja Terveystieteiden Asiakastietojen Sähköisestä Käsittelystä 784/2021)

The Ethical Council of Optometry (OEN) in Finland was established in 1997 to provide internal oversight and guidance to the optometric profession. Finnish Association of Vision and Eyecare (NÄE ry) and the Finnish Professionals of Optometry (SOA) maintain the Council. It issues opinions, guidelines, recommendations, and other statements within the profession and, when appropriate, to the supervisory

authority. The OEN is comprised of a lawyer, representatives of employees and employers, representatives of educational institutions providing training for the profession, and an ophthalmologist. (OEN 2021a)

The Ethical Council of Optometry in Finland has created a Code of Ethics for the Practice of Optometry 2014, which aims to support ethical decision-making by optometrists and opticians in their daily work.

The optician's role is to maintain and promote good public vision and preventive eye healthcare.

In the exercise of their profession, opticians must comply with the laws, regulations and social and health Ministry of Health, Valvira, regional state administrative agencies and the Optometry Ethics Council.

An optometrist must maintain and promote the profession's prestige to the public, other healthcare professionals and regulatory authorities through their activities and actions.

The optician shall assess their competence when accepting assignments and be personally responsible for their actions and the measures they take.

An optician is primarily responsible for their actions to the service user.

The optician must observe good manners, high ethics and morality in their activities.

The optician shall act reasonably in performing their duties and treat each person equally and according to their individual needs.

The optician shall respect their own and others in the profession and shall not criticize the work of others.

The optician shall actively follow developments in the field, ensure the necessary further training and education, and maintain their professional skills through regular continuing education and training.

Health professionals deal with any errors in providing vision care appropriately.

If necessary, the optician shall bring professional ethics and these ethical guidelines to The Ethical Council of Optometry.

(OEN 2014)

Only in two European countries, Greece and Lithuania, is the content of eye examinations carried out by optometrists regulated by law according to the ECOO Blue Book 2020. The most common is that internal guidelines within the local optometric profession govern vision and eye health examinations. (ECOO 2020) For example, OEN has published the Good Optometric Examination Practice Guidelines, so-called Current Care Guidelines for examinations related to vision, eye health and contact lenses. (OEN 2021b) A standard eye examination by a Finnish optometrist includes case history, prescription, follow-up time- next check-up, ocular motility test, anterior eye assessment, objective refraction, subjective refraction, binocular vision assessment, near vision assessment, posterior eye assessment, discussion of findings, and giving the patient a copy of their prescription for spectacles or contact lenses (ECOO 2020).

The National Supervisory Authority for Welfare and Health (Valvira) published a statement about the professional roles of opticians and ophthalmologists on 29.8.2013, updated on 20.11.2019. The statement says healthcare professionals must apply generally accepted and empirically based sound practices. In addition, professional skills must be maintained through continuous further training. This statement is based on Article 15 of the Act on Health Care Professionals. Furthermore, Article 22 of the same Act states that only legalized medical practitioners can decide on a patient's medical examination, diagnosis and treatment. However, according to Article 23 of the Act, a legalized healthcare professional may, by his training, experience and job description, initiate treatment based on the patient's symptoms, the information available and his assessment of the need for treatment. (Valvira 2019)

Furthermore, all healthcare professionals are obligated under the Act on Patient's Status and Rights to inform the patient of their clinical findings and conclusions. The statement also says that optometrists must refer patients to a physician when the examinations reveal results or symptoms indicating possible eye diseases or the need for medical examination. (Valvira 2019)

Opticians and optician service providers are subject to the same legislation as other healthcare professionals and providers.

Finnish optometry is at a high level by European standards. In the WCO Competency Model, Finland is in Category 3 (with diagnostic drugs). Optometrists in Finland are legally restricted from prescribing therapeutic drugs, referring patients to public healthcare, or prescribing spectacles to someone under eight years old or suspected of having eye disease or an eye operation. (ECOO 2020)

2.4.2 Education of Optometrists in Finland

There are two universities in Finland where it is possible to study for a Bachelor's degree in optometry: Oulu University of Applied Sciences and Metropolia University of Applied Sciences in Helsinki. There has been a Master of Health Care, Clinical Optometry – degree programme at Oulu University of Applied Sciences since 2020. (NÄE ry 2023a)

A Bachelor's degree in optometry includes optics, optometry, pathology, pharmacology, and ophthalmology studies. The curriculum is 210 ECTS. Curricula differ a little bit in their content between these two universities. (Oulu University of Applied Sciences, 2022a. Metropolia University of Applied Sciences 2023)

TABLE 3. Curricula of Bachelor's Degree of the Oulu University of Applied Sciences and Metropolia University of Applied Sciences (Oulu University of Applied Sciences, 2022a. Metropolia University of Applied Sciences, 2023)

| Oulu University of Applied Sciences | Metropolia University of Applied Sciences |
|--|---|
| Study and Communication Skills | Introduction to Optometry |
| * Studying at the University of Applied Sciences | * Learning and Study Skills |
| * Professional Communication | * Spectacle Application and Manufacturing |
| * Professional English Communication | * General Anatomy and Physiology |
| | |
| * Professional Swedish Communication | * Dispensing in Optometric Practice |
| * Basics of Social Media | * Optics of the Spectacle Lenses |
| Natural Science in Optometry | Ocular Optics and Ametropias |
| * Mathematics and Physics for Optometrists | * Optics and Applications in Optometry |
| * Geometrical Optics | * Basics of the Eye Examination |
| | * Ocular Anatomy and Physiology, Clinical Microbiology and Investigate Techniques |
| * Physical Optics | * Refraction |
| * Visual Optics | |
| Research, Development and Management Studies in Optometry | Functions of the Visual System |
| * Epidemiology and Biostatistics | * Binocular Vision |
| * Work Community Skills | * Visual Perception |
| * Researching by Developing | * Visual Ergonomics and Swedish Language Skills |
| * Towards Innovations and Entrepreneurship | * Orthoptics and Work Placement |
| Technical Skills in Optometry: Competence in Spectacle Technology | Pathology, Pharmacology and Contact Lens Fitting |
| * Basics of Optometry and Dispensing Optics | * Contact Lens Fitting and Work Placement |
| * Spectacle Lens Technology | * Pathology and Pharmacology |
| * Dispensing Optics | * Methods for Research and Development |
| Clinical Skills in Optometry: Clinical Optometry | Ocular Health and Eye Diseases |
| * Objective Refraction | * Multidisciplinary Innovation Project |
| * Subjective Refraction | * Abnormal Ocular Condition and Refractive Surgery |
| * Contact Lens | * Planning of the Thesis Work |
| * Refractive Surgery | Special Topics in Optometry and Entrepreneurship |
| * Binocular Vision | * Pediatric Eye Diseases and Vision |
| * Visual Development and Pediatric Optometry | * Low Vision Patients and Elderly People |
| * Occupational Optics and Visual Rehabilitation | * Work Placement in Optometric Practice |
| | * Entrepreneurship in Management in the Social and Health Care Sector |
| Medical Skills in Optometry: | * Execution of the Thesis Work |
| * General Anatomy and Physiology | Optometrists as a Health Care Professional |
| * General Microbiology, Immunology, and Pathology | * Optometrist as a Health Care Professional and the Work Placement |
| | * Reporting of the Thesis and Maternity Test |
| * General Pathology and Diseases | Elective studies |
| * General Pharmacology | Bachelor's Thesis |
| * Neurology | |
| * First Aid | |

| | |
|--|-----------------------|
| * Visual Perception | |
| * Anatomy and Physiology of the Eye and Vision | |
| * Ocular Pharmacology | |
| * Abnormal Ocular Conditions | |
| Free Choice Studies | |
| Practical Training | |
| Bachelor's Thesis | |
| Total 210 ECTS | Total 210 ECTS |

Master of Health Care, Clinical Optometry – degree programme is provided to optometrists who are allowed to use diagnostic pharmaceutical drugs and have a license to fit contact lenses. Students must have at least two years of postgraduate work experience in optometry before starting this degree programme. The curriculum is 90 ECTS. The degree programme started at Oulu University of Applied Sciences in August 2020. (Oulu University of Applied Sciences 2022b)

TABLE 4. The curriculum of the Master of Health Care, Clinical Optometry (Oulu University of Applied Sciences 2022b)

| |
|---|
| Methods of Research and Knowledge Production |
| Clinical Biomedicine and General Clinical Procedures and Laboratory Tests |
| Advanced Ocular Science and Neurology and Clinical Ocular Procedures and Laboratory Tests |
| Ocular Pathophysiology and Clinical Ocular Procedures and Laboratory Tests |
| General and Ocular Pharmacology and Clinical Ocular Procedures and Laboratory Tests |
| Free-choice studies |
| Master's Thesis |
| Total 90 ECTS |

For Oulu University of Applied Sciences (OAMK) and Metropolia University of Applied Sciences in Helsinki, the ECOO accreditation process is still ongoing. Metropolia University has already passed the first two stages, but there is still work to be done on the third, mainly on the clinical competence of graduating optometrists. For OAMK, the process is still ongoing. (Tast 2023)

The Ethical Board of Optometry in Finland issued guidelines on using professional titles in optics on October 5th 2017. Legalized opticians have a right to use diagnostic drugs using an "optometrist, legalized optician", or "optometrist" as a professional title. Opticians do not have a right to use diagnostic drugs using

a "legalized optician" or "optician". (OEN 2017). The guidelines are based on A Global Competency-Based Model of Scope of Practice in Optometry by WCO (Kiely & Chappell 2005).

Based on the latest official statistics by the Finnish Institute for Health and Welfare (THL), 2 633 legalized opticians were in Finland in 2022. Under 65 were 2 099 opticians. (THL 2020). According to the register of healthcare professionals maintained by the National Supervisory Authority for Welfare and Health (Valvira), 1091 opticians (31.12.2022) can use diagnostic drugs (Valvira 2023a). The Finnish Association of Vision and Eyecare (NÄE Ry) estimates that there are currently around 1500 opticians working in the optical sector in Finland. Most opticians work in optical stores doing refractions and selling spectacles and contact lenses in Finland. In addition, the number of opticians working in public eye clinics and hospitals is rising. Nowadays, about 100 opticians are working in public healthcare units. (Tast 2023). A significant proportion of opticians working in the optical sector (73 %) have limited prescribing rights for diagnostic drugs and are, therefore, entitled to the optometrist title (Valvira 2023).

Healthcare professionals have compulsory continuing education (Act of the Health Care Professionals 559/1994). The Ethical Board of Optometry in Finland has determined opticians and optometrists have to achieve a minimum of continuing education points every five years. The required minimum points is 30. (OEN 2014) The register for ongoing training for optometrists is public to all on the website (OEN 2023)

The Ethical Board of Optometry in Finland surveyed 2019 on how optometrists do eye examinations. 381 legalized opticians, about 25% of all licensed opticians in Finland, participated in this questionnaire survey. Of the respondents, 55% had the privilege of using diagnostic pharmaceutical medications. At that time, about 60% of all legalized opticians in Finland were optometrists. Based on that survey, Finnish optometrists replied they recognized common eye diseases well and could evaluate the urgency of the needed care. (OEN 2019)

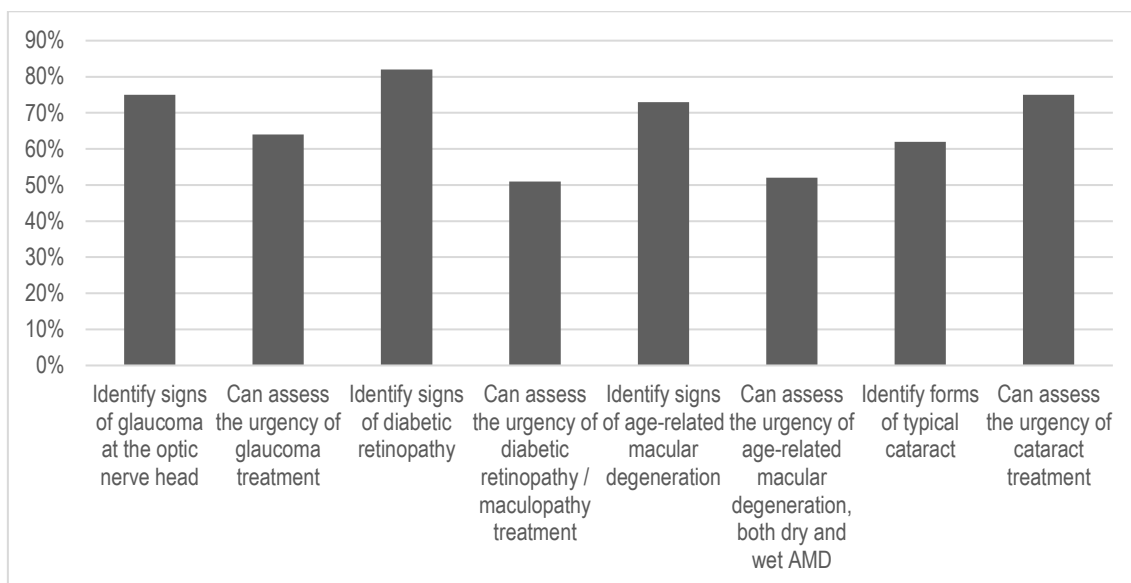


FIGURE 1. Implementation of Guidance for Licensed Optometrists in the Practice of Optometry (OEN 2019)

2.5 Optometry in Norway

With 5 504 329 inhabitants (2023), Norway's population is almost the same size as Finland's (5 559 521) (Statistik Sentralbyrå 2023). The Norwegian Directorate of Health (Helsedirektoratet) maintains a register of licensed healthcare professionals in Norway. 2260 optometrists were in that register on 31.12.2021. That amount includes all the licensed optometrists, including optometrists who are retired, not working in the optical sector, moved abroad or are dead. The Norwegian Opticians Association (Norges Optikerföbund) has calculated in three ways that 1 500 optometrists work in the optical field in Norway. First, according to that register, 1 525 Norwegian optometrists have a license to use diagnostic drugs. In practice, almost all optometrists in the optical sector have the right to use diagnostic medications. Today, all optometric graduates and licensees have this right. (Haugo H T 2022)

In the WCO's A Global Competency-Based Model of the Scope of Practice in Optometry, Norwegian optometrists are at the same level as their Finnish colleagues, Category 3, with diagnostic drugs. The only difference between Norway and the United Kingdom, which is in Category 4, is that Norwegian optometrists are not allowed to prescribe therapeutic drugs. In Norway, optometrists have no restrictions on prescription spectacles and contact lenses. (ECOO 2020)

Norwegian optometrists can refer patients to public health care if specialized care is needed. For example, they can refer a patient to an ophthalmologist or other specialized doctor, e.g., a neurologist. Optometrists

working at private eye clinics and optical stores are primary eye healthcare providers in Norway. Suppose a patient with an acute problem is in an optometrist's appointment, and an ophthalmologist's examination is needed. In that case, the optometrist can refer the patient directly to an ophthalmologist appointment or public eye hospital or consult the ophthalmologist working, e.g. in an eye hospital. Some optometrists use teleconsultation, which is not very common in Norway yet. (Haugo H T 2022)

University of South-Eastern Norway (USN) is the only university in Norway providing a Bachelor's Degree programme in optometry. The programme includes optics, optometry, pathology, pharmacology, and ophthalmology studies. The areas of competencies are (i) optics and optometry – clinical examination, handling and treatment, (ii) biomedical science, (iii) communication and interaction, legal framework and ethics, as well as (iv) innovation, knowledge-based practice and digital competence. The curriculum is 180 ECTS in length. (University of South-Eastern Norway 2023a)

Table 5. Curriculum for Bachelor's Degree in Optometry in University of South-Eastern Norway (University of South-Eastern Norway 2023a)

| Bachelor's Degree in Optometry |
|--|
| Mathematics and physics |
| Generic Anatomy, physiology and biochemistry |
| Optics and optotechnics |
| Basic optometry |
| Ocular Anatomy and Physiology |
| Examination methods |
| Optometry and society |
| Biostatistics |
| Binocular Vision |
| Visual perception |
| Pharmacology and pathology |
| Clinical optometric practice |
| Basic ocular pathology |
| Basic contact lens fitting |
| Internal clinical practice |
| External clinical practice |
| Community optometry |
| Vision rehabilitation and visual Ergonomics |
| Optional international clinical practice |
| Bachelor's Thesis |
| Total 180 ECTS |

It is also possible to study Master's degree in optometry in two specializations: "General practice optometry" and "Orthoptics and paediatric optometry". The curriculum of the Master's Degree program is 120 ECTS in length. It is possible to study Industry Master, which is open only for the Norwegian optometrists or Standard Programme. Studying for an Industry Master is full-time; half the time, students work in a relevant company. Standard Programme students are part-time students who work in their workplaces alongside their studies. Full-time study is also possible. Specialization in general practice optometry will provide competency in examining and managing various normal conditions and uncomplicated pathology of the anterior segment of the eye and the ability to communicate and cooperate in the examination and follow-up of treatment of conditions related to ARMD, diabetes and glaucoma. Specialization in orthoptics and paediatric optometry will provide competency in examining and treating children, young people and adults of all ages with different binocular vision problems. This specialization includes competency in advanced visual function assessment and prescribing treatment through visual training for children, young people and adults of all ages with oculomotor and visual perception problems. (University of South-Eastern Norway 2023b)

TABLE 6. Curriculum for Master in Optometry and Visual Science and Orthoptics and Paediatric Optometry (University of South-Eastern Norway 2023b)

| Optometry and Visual Science | Orthoptics and Paediatric Optometry |
|--|--|
| Clinical Optometrical Practice for Authorized Optometrists | Clinical Optometrical Practice for Authorized Optometrists |
| Advanced Contact Lenses | Advanced Contact Lenses |
| Advanced Ocular Pathology | Advanced Ocular Pathology |
| Science and Evidence-based Practice | Science and Evidence-based Practice |
| Research Methods and Project Description | Research Methods and Project Description |
| Quantitative and Qualitative Methods | Quantitative and Qualitative Methods |
| Advanced Clinical Methods I - Posterior Segment | Orthoptics and Paediatric Optometry |
| Advanced Clinical Methods II - Anterior Segment | Orthoptics and Vision Therapy |
| Visual Ergonomics | Master Project |
| Master Project | |
| Total 120 ECTS | Total 120 ECTS |

The Bachelor's Degree in Optometry and Master's Degree in Optometry and Visual Sciences offered by the University of South-Eastern Norway are accredited programmes for the European Diploma in Optometry by the ECOO. To obtain the European Diploma, an optometrist must complete three courses of Master's Degree studies in addition to the Bachelor's Degree. When an optometrist is studying only a Master's

Degree in Norway. To have a European diploma, they must complete the three Bachelor level courses, Advanced Ocular Pathology, Advanced Contact Lenses and Clinical Optometrical Practice for Authorized Optometrists. (ECOO 2023)

Norwegian ophthalmologists work primarily in public health care units like hospitals or clinics. Only a few ophthalmologists work totally at private clinics. The Norwegian Medical Association (Den Norske Legeforening) publishes annual figures on the number of medical specialists in different specialities. Norway's total number of ophthalmologists was 542 (2021) (Den Norske Legeforening 2023). The actual number of people working as ophthalmologists is 355, after subtracting retired people, people working in other fields, people living abroad and people who have died from the number on the register. (Haugo H T 2022)

2.6 Optometry in Sweden

Sweden is the largest country in the Nordic Region, with more than 10.5 million inhabitants (Statistics Sweden 2023). Socialstyrelsen is the authority that oversees health care and licenses all health care professionals, including opticians, in Sweden. Sweden has 4 175 legalized opticians (2021), and 2 847 are under 65. (Socialstyrelsen 2023). Since September 2016, Swedish opticians have been able to use diagnostic medicines in their work. However, the right to use diagnostic drugs requires 45 ECTS, about a year of education, of separate training after the primary studies. About 530 Swedish opticians can use diagnostic drugs (Brautaset R 2022). They are called optometrists. (Lönn S 2017). Sweden has 1585 physicians specializing in ophthalmology, of which 923 are under 65 (31.12.2021) (Socialstyrelsen 2023). About 50 % of Swedish ophthalmologists work privately, and the other 50 % are in public health care (Brautaset R 2022).

In Sweden, opticians and optometrists can prescribe eyeglasses even if a patient has an eye disease or has had eye surgery. In addition, opticians trained as orthoptists can prescribe eyeglasses to patients under eight years of age. All Swedish opticians and optometrists are allowed to refer the patient to the public or private eye healthcare unit. According to the law, the patient must be referred for further examinations if the optometrist suspects something abnormal in the patient's vision or eye health. But cataracts, for example, are considered normal ageing of the eye. Therefore, a cataract patient does not need to be referred for further examination unless the criteria for public cataract surgery are met or the patient has something else abnormal in their eyes. (Brautaset R 2022)

Like Finland and Norway, Sweden is at Category 3 (with diagnostic drugs) in the WCO Competency Model. Swedish optometrists are legally restricted from prescribing therapeutic medicines, using contact tonometry, and examining and prescribing spectacles for children under six. (ECOO 2020)

Karolinska Institutet in Stockholm and Linnéuniversitet in Kalmar offer Bachelor's Degree Programme of Optometry. The programme in both universities includes 180 ECTS of study, including studies, e.g., in optics, optometry, general anatomy and physiology, ocular anatomy, physiology and diseases, pathology, pharmacology, microbiology, contact lenses and chemistry, low vision and studies related to Bachelor's Thesis. University curricula differ slightly in content. (Karolinska Institutet 2023a. Linnéuniversitet 2023a)

TABLE 7. Curricula of Bachelor's Degree Programme of Optometry in Karolinska Institutet and Linnéuniversitet (Karolinska Institutet 2023a. Linnéuniversitet 2023a)

| Karolinska Institutet | Linnéuniversitet |
|---|--|
| Optics | Optics |
| Basic Optometry | Optometry |
| Advanced Optometry | Workshop Technology for Opticians |
| Advanced Optometry and Perception | Perception |
| Clinical Optometry | General Physiology and Physiological Chemistry |
| Environmental Optometry | Ocular Anatomy and Physiology |
| General Anatomy and Physiology | Ocular Diseases |
| Ocular Anatomy, Physiology and Diseases | Pharmacology |
| Pathology | Contact Lens |
| Pharmacology | Low Vision Optometry |
| Micro-biology | Workplace Optometry |
| Contact Lens and Chemistry | Practical Training |
| Low Vision Optometry | Statistics and Science Methods |
| Statistics and Science Methods | Bachelor's Thesis |
| Bachelor's Thesis | |
| Total 180 ECTS | Total 180 ECTS |

Swedish opticians can study postgraduate optometry after a Bachelor's Degree at both universities. The Karolinska Institutet offers studies for a Master's Degree in Clinical Optometry. In addition to the training in the use of diagnostic drugs (45 ECTS), the studies include a Master's Thesis (15 ECTS). In other words, the total number of ECTS is 60. (Karolinska Institutet 2023b) The Linnéuniversitet offers a Master's Optometry and Vision Science programme, including 120 ECTS studies. Students will major in biomedical sciences and graduate with a Master of Science with a specialization in Optometry and Vision Science. They will get

a right to use diagnostic drugs as a part of their Master's studies. (Linnéuniversitet 2023b) In Sweden, about 180 optometrists have graduated with a Master's Degree (Brautaset R 2022).

TABLE 8. Curricula of Master's Degree Programme of Optometry in Karolinska Institutet and Linnéuniversitet (Karolinska Institutet 2023b. Linnéuniversitet 2023b)

| Karolinska Institutet | Linnéuniversitet |
|--|---|
| Ocular Pharmacology and Diagnostic Examination Methods | Ocular Pharmacology and Diagnostic Examination Methods |
| Neuro-Optometry | Neuro-Optometry |
| Ocular Diseases and Diagnostic | Ocular Diseases and Diagnostic |
| Binocular Vision and Treatment | Binocular Vision and Treatment |
| Pediatric Optometry | Pediatric Optometry |
| Diagnostic Clinic | Diagnostic Clinic |
| Master's Thesis | Research Methods in Optometry and Vision Science |
| Total 60 ECTS | Advanced Quantitative and Qualitative Research Methods in Optometry |
| | Special Contact Lenses and Fitting |
| | Anterior Eye and Drye Eyes |
| | Advanced Ophthalmic Photography Techniques and Disease Evaluation |
| | Degree Project in Biomedical Science with Specialization in Optometry |
| | Total 120 ECTS |

Opticians and optometrists can study for orthoptists. Nowadays, it is a one-year education, which is meant for opticians, optometrists and nurses who have Master's Degrees. The orthoptists examine, diagnose and treat primarily patients' binocular vision problems and challenges caused by visual impairment. (University of Gothenburg 2023)

BSc in Optometry and MSc in Optometry provided by Karolinska Institutet are accredited programmes for the European Diploma in Optometry by the ECOO (ECOO 2023).

2.7 Optometry in Finland compared to the other European Countries

Finnish opticians were in category one in a Global Competency-Based Model of Scope of Practice in Optometry until the 1990s, when the evolution of optician education started. The First-Degree programme in Optometry began at the Oulu University of Applied Sciences in 1992 (Pitkääkoski, A. 2011). 73 % of legalized opticians are optometrists in Finland (Valvira 2023). Furthermore, Finnish optometrists are in category three based on educational and legislative issues, except that they are only allowed to diagnose eye diseases with a degree of suspicion (ECO 2020). Optometrists can use diagnostic drugs in their eye and eye health examinations in Finland (Valtioneuvoston Asetus Terveystenhuollon Ammattihenkilöistä 433/2010).

France and Turkey are in category one based on the European countries' WCO competency model. The United Kingdom is in the highest category, where optometrists can treat eye diseases using therapeutical drugs. (ECO 2020)

TABLE 9 . Categories of countries based on adapted WCO competency model (ECO 2020)

| Optical Technology Services | Visual Function Services | Ocular Diagnostic Services | | Ocular Therapeutic Services |
|-----------------------------|--------------------------|----------------------------|-----------------------|-----------------------------|
| | | without diagnostic drugs | with diagnostic drugs | |
| France | Belgium | Austria | Finland | United Kingdom |
| Turkey | Bulgaria | Denmark | Ireland | |
| | Croatia | Estonia | Malta | |
| | Cyprus | Germany | Netherlands | |
| | Czech Republic | Latvia | Norway | |
| | Greece | Lithuania | Sweden | |
| | Hungary | Spain | Switzerland | |
| | Italy | | | |
| | Luxembourg | | | |
| | Macedonia | | | |
| | Poland | | | |
| | Romania | | | |
| | Serbia | | | |

There are 14 countries in category three on the WCO competency model. Of those countries, seven have permitted optometrists to use diagnostic drugs. There are differences within the group regarding the rights of optometrists. Irish and Norwegian optometrists have all the rights besides using therapeutical drugs. In some countries, optometrists have to renew their licenses. In the United Kingdom and Ireland, licenses must be renewed yearly. (ECOO 2020)

The profession's scope of practice in Europe described in ECOO Blue Book 2020 indicates that Finnish optometrists are at a good level compared to many European countries.

Finnish optometrists have only three red spots on the table, which provides an overview of the scope of practice in Europe. Finnish optometrists cannot refer directly to an eye hospital and prescribe spectacles to children under six years. The age limit in Finnish law is eight years. For example, Swedish and Norwegian optometrists have the right to refer patients to the eye hospital. The United Kingdom is the only European country where local optometrists can prescribe therapeutic medications. (ECOO 2020)

TABLE 10. Scope of practice, countries from category 3 with diagnostic drugs and category 4. Green: permission, Yellow: practised, Red: prohibited. (ECO 2020)

| | FINLAND | IRELAND | MALTA | NETHERLANDS | NORWAY | SWEDEN | SWITZERLAND | THE UK |
|--|---------|---------|--------|-------------|--------|--------|-------------|--------|
| Objective refraction | Green | Green | Green | Green | Green | Green | Green | Green |
| Subjective refraction | Green | Green | Green | Green | Green | Green | Green | Green |
| Dispensing prescription spectacles | Green | Green | Green | Green | Green | Green | Green | Green |
| Selling optical appliances | Green | Green | Green | Green | Green | Green | Green | Green |
| Writing prescriptions for spectacles | Green | Green | Green | Green | Green | Green | Green | Green |
| Fitting contact lenses | Green | Green | Green | Green | Green | Green | Green | Green |
| Supply of contact lenses | Green | Green | Green | Green | Green | Green | Green | Green |
| Writing prescriptions for contact lenses | Green | Green | Green | Green | Green | Green | Green | Green |
| Examining the anterior eye | Green | Green | Green | Green | Green | Green | Green | Green |
| Examining the posterior eye | Green | Green | Green | Green | Green | Green | Green | Green |
| Ophthalmoscopy | Green | Green | Green | Green | Green | Green | Green | Green |
| Detecting ocular pathology | Green | Green | Green | Green | Green | Green | Green | Green |
| Using diagnostic drugs | Green | Green | Yellow | Green | Green | Green | Green | Green |
| Using therapeutic drugs | Red | Red | Red | Red | Red | Red | Red | Red |
| Referring to an ophthalmologists | Green | Green | Green | Green | Green | Green | Green | Green |
| Referring directly to eye hospital | Red | Green | Green | Green | Green | Green | Green | Green |
| Informing medical doctors of patients pathology | Green | Green | Green | Green | Green | Green | Green | Green |
| Non-contact tonometry | Green | Green | Green | Green | Green | Green | Green | Green |
| Contact tonometry | Green | Green | Green | Green | Green | Yellow | Green | Green |
| Checking binocular vision | Green | Green | Green | Green | Green | Green | Green | Green |
| Orthoptics | Green | Green | Green | Red | Green | Green | Green | Green |
| Perimetry | Green | Green | Green | Green | Green | Green | Green | Green |
| Myopia management | Green | Green | Green | Green | Green | Green | Yellow | Green |
| Testing drivers sight | Green | Green | Green | Yellow | Green | Green | Green | Green |
| Testing VDU (Visual Display Units) users | Green | Green | Green | Green | Green | Green | Yellow | Green |
| Fitting optical appliances for VDU users | Green | Green | Green | Green | Green | Green | Yellow | Green |
| Testing sight of low vision patients | Green | Green | Green | Green | Green | Green | Green | Green |
| Prescribing low vision aids for the partially sighted | Green | Green | Green | Green | Green | Green | Green | Green |
| Testing the vision of and prescribing spectacles to children under the age of 6 years | Red | Green | Green | Red | Green | Red | Green | Green |
| Testing the vision of and prescribing spectacles to children under the age of 12 years | Green | Green | Green | Green | Green | Green | Green | Green |
| Fitting and supplying spectacles to children (0-18 years) | Green | Green | Green | Green | Green | Green | Green | Green |

The society contributes financially to vision and eye care examinations at different levels in Europe. According to the ECOO Blue Book 2020, in most of the 31 countries surveyed, optician/optometrist examinations are not reimbursed by public funds, while ophthalmologist examinations are financially supported by society. Of the countries surveyed, only in Germany, France, and Malta does the state contribute to all the items in the table below by financially subsidising optometrists' and ophthalmologists' examinations. (ECOO 2020)

TABLE 11. Does the social system pay for eye exams for different groups? Column Europe tells the average for the countries participating in the survey. The higher the percentage, the more countries pay for the service. Red means not paid, and green means paid. (ECOO 2020)

| Does the social system | Europe | Finland | Sweden | Norway |
|--|--------|---------|--------|--------|
| pay for eye exams in adults with low vision, when the optician/optometrist is doing the examination | 32 % | Green | Green | Green |
| pay for eye exams in adults with low vision; when the ophthalmologist is doing the examination | 64 % | Green | Green | Green |
| pay for eye exams in children, when the optician/optometrist is doing the examination | 19 % | Red | Red | Red |
| pay for eye exams in children, when the ophthalmologist is doing the examination | 97 % | Green | Green | Green |
| pay for eye exams in the elderly, when the optician/optometrist is doing the examination | 19 % | Red | Red | Red |
| pay for eye exams in the elderly, when the ophthalmologist is doing the examination | 90 % | Green | Green | Green |
| provide for disability entitlement when the optician/optometrist doing the examination | 10 % | Red | Red | Red |
| provide for disability entitlement when the ophthalmologist doing the examination | 81 % | Green | Green | Red |
| pay for eye exams in adults with low income/unemployed, when the optician/optometrist is doing the examination | 29 % | Green | Red | Green |
| pay for eye exams in adults with low income/unemployment, when the ophthalmologist is doing the examination | 87 % | Green | Green | Green |
| pay for eye exams in all people, when the optician/optometrist is doing the examination | 13 % | Red | Red | Red |
| pay for eye exams in all people, when the ophthalmologist is doing the examination | 84 % | Red | Green | Green |

The Finnish Association of Vision and Eyecare (NÄE ry) regularly commissions various vision and eye health surveys. According to the study commissioned from Taloustutkimus, Silmäläisien käyttö ja näönkorjaus Suomessa 2022, 57 % of consumers buy spectacles based on an examination by an optician/optometrist and 39 % based on an examination by an ophthalmologist. 31 % of those who had their glasses ordered by an ophthalmologist went to an ophthalmologist's examination referred by an optician/optometrist, and 69 % went directly to an ophthalmologist. According to the survey, the remaining 4 % use ready-made glasses

without having an eye examination. (NÄE ry 2022a) In Europe, according to the ECOO Blue Book 2020, in 26 % of the countries surveyed, all spectacles are prescribed by an optometrist. This is the case in Norway, for example. On the other hand, ophthalmologists prescribe all spectacles in 20 % of the countries. Both groups of eye care professionals prescribe spectacles in other countries (54 %), including Finland and Sweden. (ECOO 2020)

2.8 Healthcare in Finland

2.8.1 Health and Social Services Reform

Finland has two healthcare levels: primary healthcare and specialized healthcare. The health and social services reform has significantly changed the Finnish healthcare system. Municipalities organized and financed primary healthcare services under the earlier health and social care model. Hospital districts and university hospitals produced specialized healthcare services. (Primary Health Care Act 66/1972) Twenty-two new Wellbeing Services Counties and the City of Helsinki have been responsible health and social services providers from January 1st 2023. The reform aims to improve health and social services for citizens. The reform is necessary to contain rising costs and ensure equal services for future generations. One of the objectives of the reform is to make the link between primary and specialist care more flexible. (Government 2022)

Under the old model, primary health care was funded directly by municipalities. The central hospitals and university hospitals, which provided specialized care, billed municipalities for the care they provided. The health and social services reform changed this system. The government funds wellbeing service counties, and they now have an annual budget to produce services. In addition, a part of the cost of the services is covered by customer fees and sales. (Government 2022)

The combined annual budget of the Wellbeing Services Counties is 24.3 billion euros for 2023. According to the Ministry of Finance's calculation, the combined budget will increase 25.2 % to 30.4 billion euros by 2030. (Ministry of Finance 2023a)

2.8.2 Primary Healthcare

Local health care centres play the most significant role in providing primary care. There were 21,8 million outpatient visits to public primary healthcare services, 3,2 million to private services and 8,5 million to occupational healthcare in 2022. (THL 2023a) ICD is an international classification of diseases. The World

Health Organization (WHO) creates and maintains the system. Physicians and dentists are writing the patient visits using the ICD-10 diagnosis classification. Other healthcare professionals can use ICD-10 codes as a suspect level, or they can use ICPC-2 classification. (WHO 2023) Due to different recording methods and levels, complete statistics on primary healthcare diagnoses are unavailable. However, the number of diagnoses recorded in public primary healthcare outpatient clinics with ICD-10 codes in Finland in 2022 was 4,5 million, of which around 100 000 (2,2%) were related to eye health. Almost half of the ICD-10 code-recorded diagnoses were H10 Conjunctivitis – cases (42.5 %). At the same time, in primary public healthcare outpatient clinics, there were 4,9 million diagnoses recorded under ICPC-2 codes, of which 77 000 were related to eye health. The most common ICPC-2 code was F03 Eye Discharge (27 %), and the second most common was F29 Eye Symptoms / Complaints, Other (23 %). (THL 2023b)

TABLE 12. Ten most common ICPC-2 and ICD-10 eye-related diagnoses of outpatient visits in public primary healthcare. (THL 2023b)

| ICPC-2 | | | ICDC-10 | | |
|--------|-----------------------------------|------|---------|-----------------------------------|--------|
| F03 | Eye discharge | 27 % | H10 | Conjunctivitis | 42,5 % |
| F29 | Eye symptoms/complaints, other | 23 % | H53 | Visual Disturbances | 7,7 % |
| F02 | Red eye | 9 % | H00 | Hordeolum and Chalazion | 7,1 % |
| F16 | Eyelid symptom/complaint | 7 % | H01 | Other Inflammation of Eyelid | 7,1 % |
| F01 | Eye pain | 5 % | H04 | Disorders of the Lacrimal System | 5,6 % |
| F70 | Conjunctivitis infectious | 5 % | H16 | Keratitis | 3,8 % |
| F13 | Eye sensation abnormal | 5 % | H57 | Other Disorders of Eye and Adnexa | 3,7 % |
| F73 | Eye infection/inflammation, other | 5 % | H43 | Disorders of the Vitreous Body | 3,1 % |
| F72 | Blepharitis/stye/chalazion | 4 % | H40 | Glaucoma | 3,0 % |
| F05 | Visual disturbance, other | 4 % | H11 | Other Disorders of Conjunctiva | 2,7 % |
| | Others | 6 % | | Others | 13,7 % |

2.8.3 Specialized Health Care

Finland has fifty medical specialities divided into operative, conservative, diagnostic, psychiatric, and other. The three largest specialities are general medicine, psychiatry and, anaesthesiology and intensive care in terms of the number of specialists. Ophthalmology is classified as an operative speciality and is the ninth largest speciality. (The Finnish Medical Association 2023)

The wellbeing counties are responsible for the public specialist healthcare services. They can produce services by themselves, together with other wellbeing counties, or purchase services from other wellbeing counties or private service providers (Government 2022). The public specialized healthcare services are mainly produced in hospitals and their clinics. Finland has five highly specialized healthcare-providing university hospitals in Helsinki, Tampere, Turku, Kuopio and Oulu. Each university hospital has its collaborative area of 4-8 wellbeing services counties. The collaborative areas promote regional coordination and development of healthcare, social welfare, and cooperation between the counties. (Ministry of Social Affairs and Health 2023) Besides university hospitals, Finland has 15 central hospitals, five regional hospitals, and six health centres that provide specialized healthcare services. (THL 2023c).

According to the latest statistics by the Finnish Institute for Health and Welfare (THL), there were around 9.6 million episodes of care in public specialized health care in 2020. Of these episodes, about 1,7 million were urgent or emergency episodes. Just under 620 000, 6,5 % of all episodes were related to ophthalmology. (THL 2023c)

2.8.4 Urgent Medical Care

Chapter 6, Article 49 of the Health Care Act 1326/2010, provides emergency care. Emergency care must be provided to everyone, regardless of where they live. The law stipulates that emergency care means the quick assessment and treatment of the need for care in the event of sudden illness, injury, aggravation of a long-term condition or a decline in functional capacity, which cannot be postponed without the bother of the disease or disturbance of the disability. Primary healthcare is responsible for emergency services. Emergency clinics are often in health centres, but clinics can be a part of hospitals. Patients needing specialist care are referred to regional, central or university hospitals. (Health Care Act 1326/2010)

There are around 1.7 million emergency outpatient procedures in specialized care each year. Of these, around 32 000 cases are treated in ophthalmology units each year (THL 2023a).

2.8.5 Access to Non-urgent Medical Care

In Finland's health care law, access to treatment is provided. Under the current legislation, the health care professional must assess the need for treatment no later than the third working day after the patient contacts the health centre if the assessment cannot be carried out during the first contact. In the case of specialized health care provided in primary health care, the care needs assessment must be started within three weeks of receiving the referral. The assessor of needed care must be a licensed healthcare professional. Name-

protected healthcare professionals, such as practical nurses, cannot assess the need for care. (Health Care Act 1326/2010)

When treatment is considered medically necessary, it must be given within a reasonable time, considering the patient's state of health and the foreseeable development of the disease. However, treatment must be started within three months of assessing the need. This maximum period of three months may be exceeded by a maximum of three months if specialized medical care is provided in the context of primary health care. Postponement of the start of treatment is also possible if the treatment can be postponed for medical, therapeutic, or similar justified reasons without endangering the patient's health. (Health Care Act 1326/2010)

According to the Health Care Act amendment that will enter into force on 1.9.2023, the wellbeing service counties must organize activities so the patient can contact the health centre or other primary healthcare unit during the same day weekday office hours. In addition, the health care professional has to give an individual assessment of the need and urgency of the patient's examination or treatment and of which health professional's examination or treatment the patient needs. The treatment has to begin within 14 days of assessing the need. The other amendment to the Health Care Act will enter into force on 1.11.2024. After that, the patient has to get treatment within seven days of assessing the need. (Health Care 1326/2010 Amendment 19.1.2023)

The wellbeing counties are responsible for assessing the need for care in specialized healthcare Government. (2022). Hospitals provide specialized care services by referrals from health centres and private doctors. An assessment of treatment must be done in three weeks at the hospital or other specialized medical unit. If the assessment of needed treatment requires consultation with a specialist, special testing, or laboratory test, required tests and the assessment shall be done in three months. Any treatment must be done six months after the hospital or another specialized medical unit receives the patient's referral. Regulations concerning access to treatment in specialized care are not changing. (Health Care 1326/2010 Amendment 19.1.2023)

TABLE 13. Minimum legal access times to treatment. (Health Care 1326/2010 Amendment 19.1.2023)

| | | Assessment of treatment | Assessment of treatment with specialist, special and or laboratory tests | Treatment |
|--|---------------------|-------------------------|--|-----------|
| Primary health care | Current regulations | 3 days | | 3 months |
| | From 1.9.2023 | On the same day | | 14 days |
| | From 1.11.2024 | On the same day | | 7 days |
| Specialized health care | Current regulations | 3 weeks | 3 months | 6 months |
| Regulations in specialized health care are not changing. | | | | |

Regarding the statistics, only 0.3% of patients (5 474) had to wait for treatment in primary healthcare services for over three months in 2022. However, 358 317 patients, 22.7% of all the patients, had to wait longer to start treatment than the seven-day non-urgent treatment guarantee that comes into force on November 1st 2024. (THL 2023d) 160 791 patients waited for public specialized care treatment on 31.12.2022. Of those patients, 12.7% had been waiting for treatment for over six months. In terms of numbers, most patients were waiting for treatment for more than six months in surgery (11 228 patients), ophthalmology (3 411 patients) and psychiatry (1 161 patients). Almost 13 % of all those waiting for eye care had been waiting for more than six months. (THL 2023e)

Suppose the wellbeing service county cannot provide health and social services within the maximum time ordered by Health Care Act. In that case, the wellbeing region must provide services with other wellbeing service counties or health and social service providers. (Health Care 1326/2010 Amendment 19.1.2023)

2.8.6 The Challenges of an Ageing Population for Healthcare

Finland's population is ageing due to a low birth rate. The fertility rate describes the population's birth rate and shows how many children a woman would give birth to in her lifetime if the birth rate remained at the level of the census year. In 2022, the number of live births was the lowest in 150 years, and the mortality rate was the highest since 1945. As a result, the fertility rate was 1.32, the lowest in Statistics Finland's measurement history. (Statistics Finland 2023a) Finns, like the rest of the world's population, live longer than before. A newborn's average life expectancy has increased significantly over the years. Life expectancy

for the baby boomers born after the wars, 1946-50, was 58.42 for men and 65.84 years for women. Thirty years later, for those born in 1980, the corresponding figure had already increased by about ten years for both men and women. For boys born in 2022, the average life expectancy will be 78.63 years and 83.79 years for girls. (Statistics Finland 2023b) For these reasons, the share of the senior population in the total population is growing all the time. In 1950, there were 265 980 people over 65, 6.6 % of Finland's total population. The corresponding figure was 15 % of the population at the turn of the millennium. In 2022, there were 1 296 442 over 65, 23.3 % of the total population. In the same period, the average age of Finns has risen from 31.6 to 45. (Statistics Finland 2023c) According to Statistics Finland's projection, there will be 1 462 251 people over 65 in Finland, 26.2. % of the population in 2030 (Statistics Finland 2022).

Table 14. Population according to age, whole country, actual in 1980-2020 and projections in 2030-2070 (Statistics Finland 2022)

| | Age 0-14 | Age 15-64 | Age 65 and over | Total population | Over 65 as a proportion of the total population |
|------|----------|-----------|-----------------|------------------|---|
| 1980 | 965 209 | 3 245 187 | 577 382 | 4 787 778 | 12,10 % |
| 1990 | 964 203 | 3 361 310 | 672 965 | 4 998 478 | 13,50 % |
| 2000 | 936 333 | 3 467 584 | 777 198 | 5 181 115 | 15,00 % |
| 2010 | 887 677 | 3 546 558 | 941 041 | 5 375 276 | 17,50 % |
| 2020 | 860 861 | 3 416 994 | 1 255 938 | 5 533 793 | 22,70 % |
| 2030 | 720 602 | 3 383 832 | 1 462 251 | 5 566 685 | 26,30 % |
| 2040 | 687 710 | 3 319 735 | 1 518 083 | 5 525 528 | 27,50 % |
| 2050 | 655 602 | 3 187 641 | 1 579 053 | 5 422 296 | 29,10 % |
| 2060 | 593 273 | 3 024 417 | 1 681 309 | 5 298 999 | 31,70 % |
| 2070 | 557 283 | 2 860 088 | 1 763 040 | 5 180 411 | 34,00 % |

Due to the ageing of the population, the demographic dependency ratio, which reflects the maintenance responsibility of the working-age population, is increasing. On the other hand, a declining birth rate will lower the dependency ratio. The dependency ratio describes the proportion of economically inactive age groups, those under 15 and those over 64, relative to the working-age population (Statistics Finland 2023d). In 2022, the demographic dependency ratio was 62.9 % in Finland and 71.7 % in Lapland Wellbeing Service County. The prediction for 2030 is 65.3 % for the country as a whole and 76.8 % in Lapland, so the share of passive age groups is increasing significantly in the economic sense of public economics. (Statistics Finland 2021)

Demographic change challenges economic growth, undermining the ability to sustain the promised public services and desired income distribution in the years ahead. Tax revenues support solid public economics, and as the number of people in employment declines relative to the economically inactive population, tax

revenues are reduced. Without a significant labour migration, the challenge will worsen, and the tax burden on the employed risks will become much higher than it is today without substantial fiscal retrenchment. (Valkonen, Tarmo & Lassila Jukka 2021)

As people age, their need for healthcare services increases. According to the Finnish Institute for Health and Welfare, in 2014, healthcare expenditure for Finns aged 65 and over accounted for 45.8 % of total costs in 2011. Per capita healthcare expenditure also increases with age. That year, the average healthcare costs of a single Finn was 3 352 euros, compared to 4 867 € for those aged 65-74, 9 705 € for those aged 75-84 and 21 236 € for those aged 85 and over. (Kapiainen, Satu & Eskelinen, Janne 2014)

Total healthcare costs in Finland are growing significantly all the time. Between 2000 and 2020, costs have increased by 13.2 billion euros to 22.9 billion euros, an increase of 136 % in twenty years. Even if the 2000 expenditure were converted to 2020 prices, the cost increase would have been 9.1 billion euros. (Matveinen, Petri 2023) Annual health costs are the most significant spending item on the Finnish national budget. In 2020, central government expenditure amounted to 68.7 billion euros. So, at the 2020 level, healthcare spending will account for about 33 % of the total budget. (Government 2021) The Organisation for Economic Co-operation and Development (OECD) annually publishes Health Statistics, including health expenditure statistics. The statistics show that health expenditure as a percentage of gross domestic product (GDP) has increased by 34.4 % between 2000 and 2020. In 2020, health expenses accounted for 9.5 % of Finland's GDP. (OECD 2023)

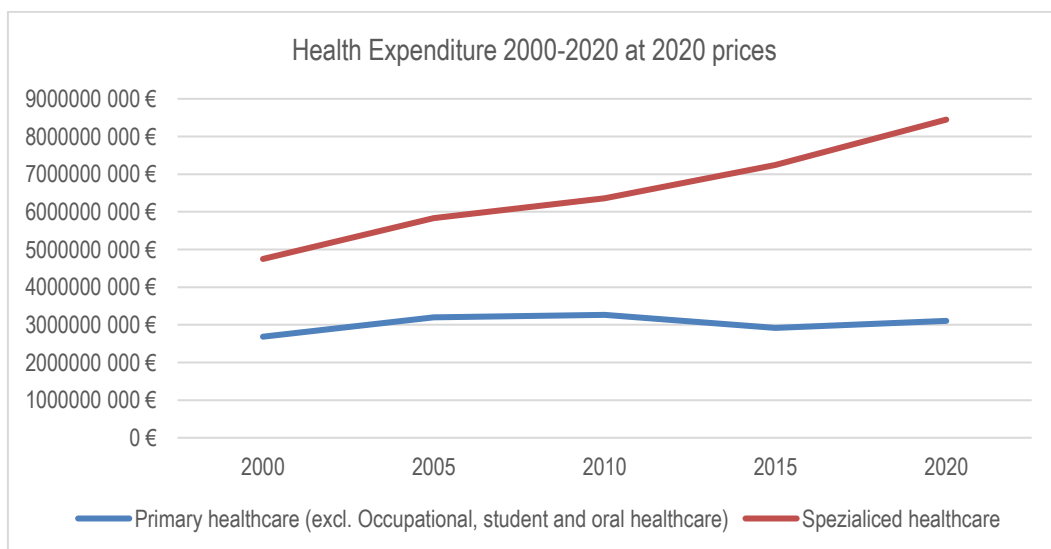


Figure 2. Health expenditure 2000-2020 at 2020 prices (Matveinen, Petri 2023)

The State funds the activities of Wellbeing Services Counties. In 2023, the total funding will amount to 22.5 billion euros, of which emergency services will account for only 0.5 billion euros, 2.2 % of total expenditure (Ministry of Finance 2023b). According to the Ministry of Finance's prediction, the Wellbeing Services Counties will need 30.5 billion euros in 2030 to provide social, health and rescue services at current levels. Expenditure will increase by 25 % over seven years. (Ministry of Finance 2023a)

In addition to state funding, the wellbeing services counties receive revenue funding from patient charges levied on residents, the maximum amount of which is set by law. If the patient is from the other wellbeing services county, the treating county charges the patient's home county for the treatment. Wellbeing services counties will charge strictly for services they provide foreigners. (Laki Sosiaali- ja Terveystieteidenhallinnon Asiakasmaksuista, 734/1992) The Wellbeing Services County of Lapland charges residents 20.90€ per visit to a general practitioner in primary healthcare and 41.80€ per visit in specialized healthcare. The fee for an emergency visit is 28.70. (Lapha 2022)

2.9 Eye Healthcare in Finland

2.9.1 Eye Healthcare Professionals in Finland

Eye healthcare services are provided mainly by three healthcare professional groups in Finland: ophthalmologists, optometrists/opticians and nurses. Nurses are assistant professionals primarily working in public and private eye clinics. Nurses are registered nurses who have studied to become ophthalmic nurses, either through further education or on-the-job training. (NÄE ry 2023b)

An ophthalmologist is a healthcare professional trained as a doctor specializing in eye diseases. A licensed physician makes the decisions about medical research, diagnoses and treatments for patients. Doctors study primary medical education for about six years to have a right to practise the profession of the physician as a licensed professional. After that, they can apply for a five to six-year specialization course, for example, in ophthalmology. (NÄE ry 2023b) Ophthalmologists can specialize in neuro-ophthalmology and or eye surgery (Lääketieteelliset.fi 2023).

The ophthalmologists work in public eye clinics, private eye clinics, or as independent professionals in optical stores and private medical centres. It is common for ophthalmologists to be part-time workers in public eye clinics and have a private practice in the optical store. There are 858 ophthalmologists in Finland (31.12.2022), of whom 578 are under 65. (Valvira 2023). In addition, NÄE ry estimates that around 400

ophthalmologists, about 70 % of working-age ophthalmologists, have private practices in opticians' shops, private eye hospitals and medical centres (Tast 2023).

Legalized opticians are healthcare professionals who have studied optometry and have the right to practice the optician profession. If the optician has graduated after 2014 or completed the required specialized studies, the optician has a right to use diagnostic medication. These opticians are optometrists, legalized opticians. (Valtioneuvoston Asetus Terveystieteiden Ammattihenkilöistä 433/2010)

TABLE 15. The number of legalized opticians in Finland on 31.12.2022 The amount of licensed specialized doctors for ophthalmology and neuro-ophthalmology, legalized opticians and legalized opticians who have the right to use diagnostic drugs, optometrists in Finland on 31.12.2022. (Sallinen E 2023)

| Professional rights | Licensed specialized doctor | Age | Number of professional rights | Number of licensed persons |
|---|---|------------|--------------------------------------|-----------------------------------|
| Medical speciality | Ophthalmology, neuro-ophthalmology | | | |
| Valid professional right | 31.12.2022 | >= 65 | 280 | 278 |
| | | < 65 | 578 | 572 |
| Total | | | 858 | 850 |
| Professional rights | Legalized optician | | | |
| Valid professional right | 31.12.2022 | >= 65 | 534 | 534 |
| | | < 65 | 2099 | 2099 |
| Total | | | 2633 | 2633 |
| Professional rights (additional right) | Optometrist, legalized optician | | | |
| Valid professional right | 31.12.2022 | | 1091 | 1091 |
| Total | | | 1091 | 1022 |

There are 2 671 working-age eye care professionals under 65 in Finland (31.12.2022), 572 doctors specialising in ophthalmology or neuro-ophthalmology and 2 099 licensed opticians. Of the licensed opticians, optometrists with a licence to use diagnostic medicines account for just over half, 1 091. (Sallinen E 2023)

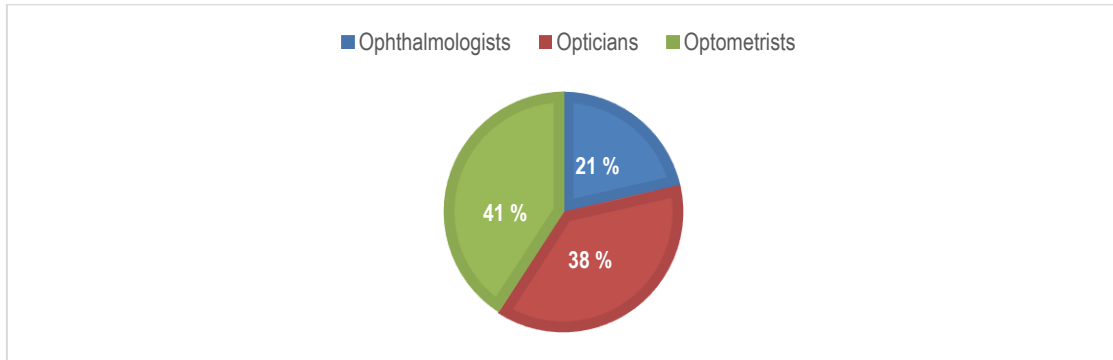


FIGURE 3. Proportions of different eye care professional groups in 31.12.2022 (Sallinen E 2023)

According to the ECOO's Blue Book 2020 study, Finland has the fourth highest number of European optometrists concerning population. In the same survey, Finland has the 16th highest number of ophthalmologists per capita out of 29 countries. (ECOO 2020)

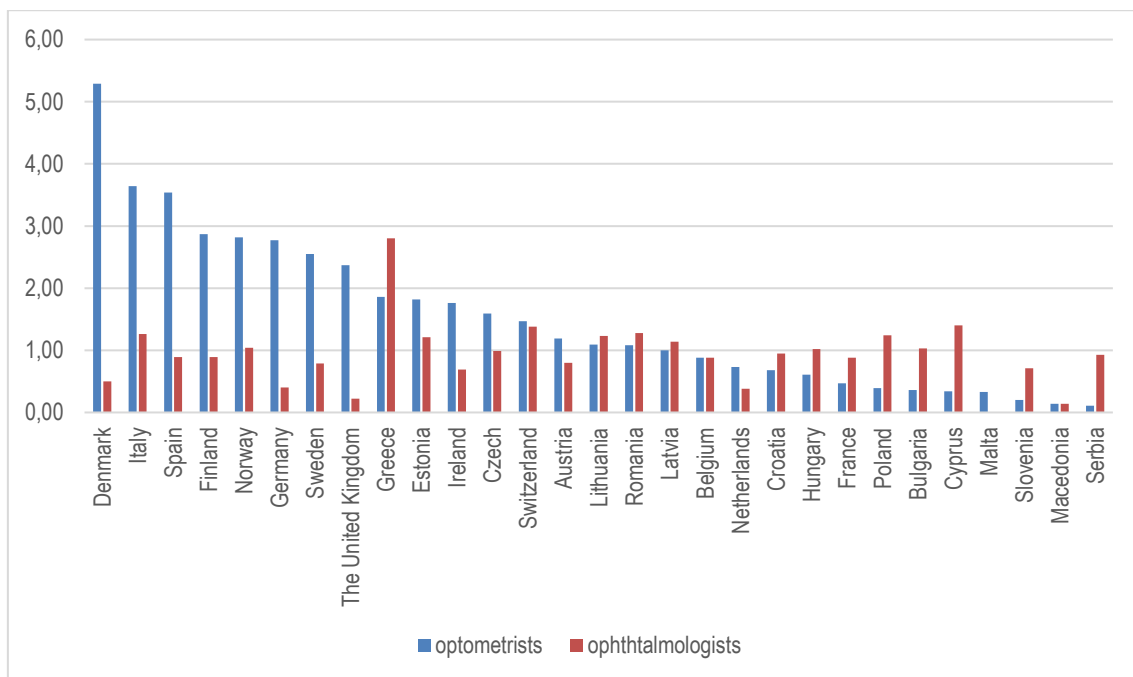


FIGURE 4. The number of all optometrists and ophthalmologists / per 10 000 population (WCO scope of practices categories 2, 3 and 4) (ECOO 2020)

2.9.2 Eye Healthcare Providers

Nowadays, there is no eye healthcare at the primary healthcare level in Finland. In principle, all public eye healthcare is at the specialist level. Five university hospitals, 15 central hospitals, five other hospitals, and three health centres in Finland provide public eye healthcare services. (THL 2023c)

| | |
|---------------------|---|
| University Hospital | Helsinki University Hospital Kuopio University Hospital Oulu University Hospital Tampere University Hospital Turku University Hospital |
| Central Hospital | South Carelia Central Hospital, Lappeenranta Central Hospital of Kainuu, Kajaani Central Hospital of Tavastia, Hämeenlinna Central Hospital of Keski-Pohjanmaa, Kokkola Central Finland Central Hospital, Jyväskylä Kymenlaakso Central Hospital, Kotka Lapland Central Hospital, Rovaniemi Central Hospital of Länsi-Pohja, Kemi Mikkeli Central Hospital North Karelia Central Hospital, Joensuu Päijänne Tavastia Central Hospital, Lahti Satakunta Central Hospital, Pori Central Hospital of Savonlinna Southern Ostrobothnia Central Hospital, Seinäjoki Vaasa Central Hospital |
| Other hospitals | Forssa Regional Hospital Iisalmi Regional Hospital Pietarsaari Hospital Raahe Regional Hospital Varkaus Hospital |
| Health Center | Heinola Health Center Kuusamo Health Center Turku Health Center |

FIGURE 5. Public eye healthcare providers. (THL 2023c)

Five university hospitals carry out all the most challenging operations and treatments in eye health, such as retinal surgery and treatment of eye tumours. The most specialized cases, such as treating malignant melanoma of the eye, are concentrated at Helsinki University Hospital. (Loukovaara, S. & Haukka, J. 2021)

The central hospitals provide, for example, an ophthalmologist's outpatient clinic, pediatric strabismus treatments and basic eye surgery, such as cataract surgery. In addition, intra-ocular injections have grown significantly in recent years and are also performed in central hospitals. Other hospitals and health centres primarily provide an ophthalmologist's outpatient clinic. (Loukovaara, S. & Haukka, J. 2021)

2.9.3 Private Eye Healthcare Providers

In Finland, an ophthalmologist's practice is traditionally in almost every optician's shop. Finland has 687 optical stores (31.12.2021) (NÄE ry 2022b). Around 70 % of them (488/687, 2021) have an ophthalmologist's practice. In addition to ophthalmology services, optical stores offer optometrist examinations, dry eye examinations, eye imaging services, and other examinations. Furthermore, 604 private healthcare units (opticians' shops, private eye surgeries and medical centres) provided ophthalmology specialist services in 2021 (Valvira 2021).

The examination fee charged by ophthalmologists varies between 100€ and 200€ depending on the location, the ophthalmologist and the time spent on the examination. The cost of eye examinations by opticians and optometrists differs from one company to another. In some companies, the optician's and optometrist's eye examination is included in the price of the glasses purchased, while in others, it is always charged separately. The table below summarizes the costs for eye examinations set by the biggest optical chains, Instrumentarium, Silmäasema, Specsavers and Synsam and by Brillet, an optical store in Rovaniemi, as an example of private opticians' shops, as well as the charges for OCT examinations, where such a service is available. The prizes are the regular prizes for examinations without purchasing eyeglasses or contact lenses. (Brillet 2023, Instrumentarium 2023, Silmäasema 2023, Specsavers 2023 Synsam 2023)

TABLE 16. Prices of eye examinations and OCT – examinations by opticians and optometrists. (Brillet 2023, Instrumentarium 2023, Silmäasema 2023, Specsavers 2023, Synsam 2023)

| | Eye examination | OCT examination |
|-----------------|-----------------|-----------------|
| Instrumentarium | 25 € | 60 € |
| Silmäasema | 35 € | 79 € |
| Synsam | 35 € | - |
| Specsavers | 24 € | - |
| Brillet | 45 € | 50 € |

Private eye hospitals, eye clinics and medical clinics also provide private eye care services. They provide examinations of ophthalmologists and optometrists, eye surgery, eye imaging services and other examinations. Private eye care providers offer 80% of primary eye care services. That is almost 1 500 000 patient visits a year. (NÄE ry 2022c)

2.9.4 Eye Healthcare Treatment Volumes and Access to Treatment

Twenty-eight medical units provide specialized public eye health care services in Finland. They carried out 663 309 treatment periods in 2021, including 596 091 treatments in clinics, 30 778 emergency care treatments, 29 730 surgical operations and 6 710 patient treatments in the hospital's inpatient wards. Intravitreal injections are the most common procedures performed in public ophthalmology medical units. The number of injections has grown rapidly in a few years, with 19 624 injections in 2011 and 99 023 in 2020. (THL 2023f) Intravitreal injections are nowadays the gold standard, especially for treating age-related macular degeneration (AMD), diabetic maculopathy and retinal vein occlusion (Kamjoo et al. 2023)

Age is the most common cause of cataracts. In principle, cataracts grow on everyone as they get older. Cataracts can only be treated by surgery. Surgery can be performed once the ophthalmologist has diagnosed a cataract. (Lam et al. 2015) As the population ages, the prevalence of cataracts increases at the same rate. As a result, public health services have had to set strict criteria for access to cataract surgery. That will help manage the surgery waiting list and stay within the treatment guarantee. Below are the requirements for cataract surgery described in the Current Care Guideline for cataracts that are paid for by the public health system. Private cataract surgery can be performed without meeting the above criteria. (Duodecim 2019) From the beginning of 2023, Kela does not pay any reimbursements for private cataract surgeries (KELA 2022).

TABLE 17. Eligibility criteria for cataract surgery paid for by the public sector. (Duodecim 2019)

| |
|---|
| The best-corrected visual acuity of the better eye is 0.5 or less. |
| The best-corrected visual acuity in the worse eye is 0.3 or less. |
| Cataract disturbs daily activities, e.g. driving by car significantly. |
| The patient suffers from anisometropia after previous surgery (>2.0D). |
| Cataract bothers the patient in some other essential way, e.g. treatment of glaucoma or diabetic retinopathy. |

In 2021, Sirpa Loukovaara and Jari Haukka published the study "Ophthalmic procedures in Finland 2010-2016". The study was a historical cohort study based on the Finnish Institute for Health and Welfare (THL) register data covering all ophthalmic surgical subgroups according to the Nordic surgical classification. THL's registers do not include surgeries performed privately or as a purchased service, so the results only show surgeries performed in public health care. The study shows that 80 % of all eye operations performed by public health services are completed on people over 60. The median age of patients between 2010 and 2016 was 72.39 years. (Loukovaara, S. & Haukka, J. 2021)

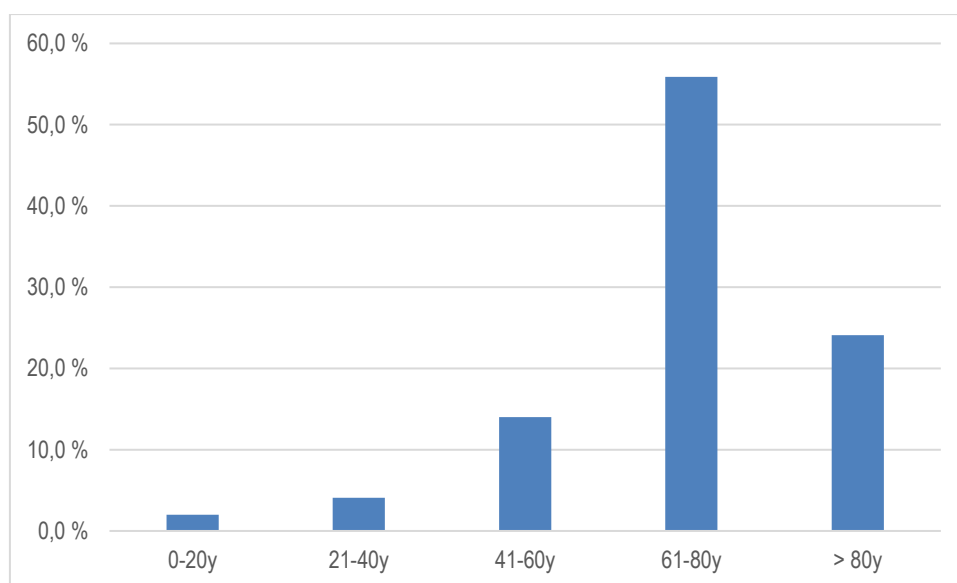


FIGURE 6. Age distribution of cataract-operated patients. (Loukovaara, S. & Haukka, J. 2021)

Around 50,000 cataract operations are performed in our country every year by the public health service. Before the Covid-19 pandemic 2019, 57 635 cataract surgeries were operated on. The number fell slightly to 50 456 in 2021 due to restrictions caused by the coronavirus epidemic. Cataract operations increased by 27% from 2011 to 2019 due to the ageing of the Finnish population. Secondary cataracts, called after-

cataract or posterior capsular opacification, may develop after primary cataract surgery. The amount of posterior capsular opacification operations grew significantly faster than cataract surgeries; from 2011 to 2019, the increase was 107%. (THL 2023f)

Measuring eye pressure is one of the most common examinations by an ophthalmologist and optometrist. It is most commonly associated with screening, investigating and monitoring glaucoma progression. In 2019, 30 562 eye pressure measurements were taken in public eye care units. Glaucoma diagnosis and monitoring are often accompanied by fundus photography, visual field testing and OCT scans, which are also used in other eye disease groups, such as age-related macular degeneration. A total of 147 280 such examinations were performed in public eye care units in 2019. (THL 2023f)

26 771 patients were waiting for public specialized eye care services, of which 12 568 (46,9 %) were waiting for cataract surgery, according to the statistics 31.12.2022. 12.2 % of those patients (3 262) had been waiting for treatment for over six months. By the end of 2022, 1 375 patients had been waiting for cataract surgery for over six months. (THL 2023e)

Cataract surgery waiting lists have increased due to an ageing population, and the public healthcare system has had challenges in providing cataract surgeries within the six-month legal limits. Before the Covid-19 - pandemic, the proportion of patients waiting more than 180 days for cataract surgery remained below 10 % of all cataract surgery patients. With the pandemic, waiting lists for surgery increased. At its worst, more than 25 % of cataract surgery patients had to wait more than six months for surgery. In January 2022, the situation was brought back to pre-pandemic levels. But the case got worse in 2022. On 31 December 2022, almost 19 % of all cataract surgery patients had to wait more than 180 days for surgery (THL 2023g)

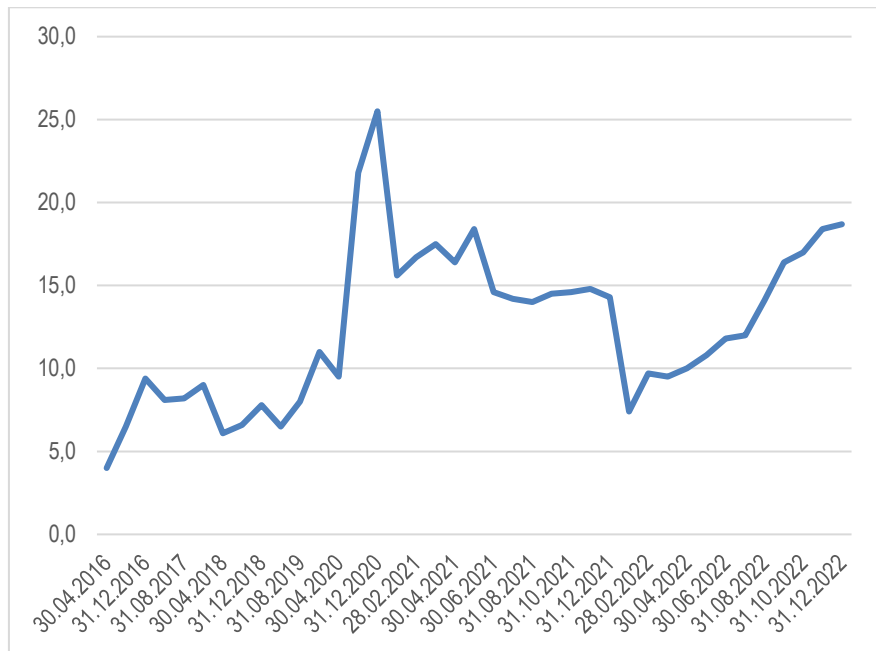


FIGURE 7. Percentage of all cataract surgery patients waiting more than 180 days for cataract surgery. (THL 2023h)

2.9.5 The Challenges of an Ageing Population for Eye Care

The prevalence of the most common eye diseases, cataracts, glaucoma, age-related macular degeneration and diabetic retinopathy increases with age. The same conditions, but in a slightly different order, top the list of the most common causes of visual impairment caused by non-hereditary eye diseases. The diseases that have a significant impact on vision acuity are age-related macular degeneration (37 %), untreated cataracts (27 %), glaucoma (22 %) and diabetic retinopathy (7 %). (Laitinen et al. 2009) Reduced vision impairs an individual’s ability to cope with everyday tasks. Motor problems such as falls leading to hip and spinal fractures are significantly reduced after cataract surgery (Huang et al. 2019).

The development of dementia in people over 70 is significantly increasing among visually impaired persons (Yu et al. 2015). Laitinen, Laatikainen, Härkänen, Koskinen, Reunanen and Aromaa conclude that the increasing incidence of eye diseases in an ageing population implies a significant need for further investment in eye healthcare to maintain the quality of life of the older people and to contain the financial burden of treatment for serious eye diseases. (Laitinen et al. 2009)

TABLE 18. Prevalence of the common eye diseases in different age groups. (Laitinen et al. 2009)

| | 30-64 | 65-74 | 75-84 | 85+ |
|----------------------------------|-------|--------|--------|--------|
| Cataract | 2 % | 22.1 % | 45.3 % | 67.1 % |
| Glaucoma | 1.9 % | 9.6 % | 16.1 % | 20.3 % |
| Age-related Macular Degeneration | 1.2 % | 8.1 % | 15.2 % | 27.2 % |
| Diabetic Retinopathy | 0.6 % | 2.2 % | 2.4 % | 1.0 % |

A Finnish research study shows that vision significantly impacts an individual's quality of life. As visual acuity falls below 0.5, the quality of life deteriorates progressively. This visual acuity is the minimum requirement for obtaining a driving license and cataract surgery. In addition, research has shown impaired vision reduces an individual's mobility, leading to reduced physical fitness, which increases the risk of developing and worsening other diseases. Mobility challenges also lead to reduced social contact, which can result in depression and other mental illnesses. In conclusion, the researchers encourage the development of new treatments or improvement of existing treatments to improve vision, slow the progression of eye diseases, and delay their impact on the accuracy and quality of life. Development efforts must consider the importance of adequate vision for an individual's overall quality of life. (Taipale et al. 2019)

Vision loss is a psychologically debilitating condition. It takes a toll on the mind and can cause depression. One in three people with severely impaired distance vision experience symptoms of depression. (Mikhailova et al. 2018)

As well as significantly impacting an individual's quality of life, reduced vision is also an economic issue for society. At current figures, impaired vision causes additional costs to society of 1.7 billion euros: 875 million euros in additional healthcare costs, 781 million euros in lost productivity due to early retirement and 64 million euros in additional costs for KELA care support. (Mikhailova et al. 2018)

2.9.6 Costs of Eye Healthcare

Twenty-eight public medical units provide public eye health care services in Finland. In Finland, the expenditure on specialized public healthcare, excluding psychiatric healthcare, in 2021 was 6 362 646 796 €. The cost of public eye health care was 200 934 478 €, which is 3.1% of that total. (THL 2023c) The patient pays a co-payment when using public health services. In primary health care, this co-payment is 20,90 € per visit. For specialized care, the amount is 41,80 € (Valtionneuvoston Asetus Sosiaali- ja Terveystieteidenhuollon Asiakasmaksuista annetun Lain muuttamisesta 211/2021).

In Finland, there are no public primary health care services in eye health care. Instead, ophthalmologists generally practising in optical shops are responsible for primary eye care services. The patient pays for private medical services by himself, through occupational healthcare or health insurance.

KELA reimburses citizens for the costs of using private healthcare services. In 2022, KELA returned 48 321 301€, of which 9 416 090€ (19,4%) was paid for the ophthalmology examinations, treatments and eye surgery. At private eye care, there were 480 473 visits in 2022. Therefore, the patient co-payment for private ophthalmology services was 57 342 532 €. The ophthalmology speciality has the highest number of patient visits and thus received the largest recipients of reimbursements among the medical specialities in 2022. (KELA 2023)

Finnish Parliament amended the Health Insurance Act, which came into force on 1.1.2023. Due to changes in the law, most of the reimbursements for examinations and treatments prescribed by private doctors were abolished. The reimbursement will still be paid for a private physician appointment, but it is the same for general practitioners and specialists, 8€ per visit. The changes do not apply to dental care. (KELA 2022)

The services of an optometrist are not paid for by society in Finland, except for eye examinations for schoolchildren.

2.9.7 Potential Savings from Private Eyecare Providers

The Finnish Association of Vision and Eyecare (NÄE) has calculated how to save on eye care costs using private providers. The calculations have been made by a controller working group of NÄE member companies. The figures used in the analyses were collected from public data in 2020, before the Social Welfare and Healthcare Reform, when the hospital districts were responsible for specialized healthcare. The calculations are based on patient numbers reported by KELA and the Finnish Institute for Health and Welfare (THL), treatment practices according to Current Care Guidelines and the average of the public price notifications of the Pirkanmaa, Pohjois-Savo and Kymenlaakso hospital districts selected for the study, as well as public price lists of private providers. The examinations and treatments chosen for the study can be obtained from optician shops and ophthalmologists who practise there. The calculations do not consider purchasing service contracts concluded by the hospital districts, as their prices are not public. The hospital districts were selected so that the Pirkanmaa represents a large, Pohjois-Savo medium and Kymenlaakso small area. The potential cost savings of the sample hospital districts have been multiplied by coefficients

representing their relative population size to give an idea of the potential savings that could be achieved at a national level. (NÄE ry 2020)

The four most common groups of eye diseases selected for the survey were diabetes-related eye diseases, glaucoma, age-related macular degeneration and cataracts. NÄE calculates that using private eye care providers could save more than 30 million euros annually, about 15 % of public eye care costs. The most significant potential savings are calculated to be in the costs of glaucoma and diabetic eye disease screening and monitoring. Cost savings are also calculated for cataracts and age-related macular degeneration. These calculations include the costs of monitoring the progression of different diseases and the effectiveness of treatment. They do not take into account eye surgery, such as cataract surgery. (NÄE ry 2020)

TABLE 19. The Finnish Association of Vision and Eyecare (NÄE) calculations of the potential savings in eye care costs. The alternative cost refers to the services provided by optometrists and ophthalmologists working in optician shops. At 0€, the customer fee covers the cost of purchasing the service, and there is no cost to society. (NÄE ry 2020)

| Kymenlaakso, a small hospital district 160 000 inhabitants (multiplier 22.2) | | | | |
|---|----------------------|---------------------------|---|----------------------------|
| | Actual current costs | Alternative current costs | Potential savings for the hospital district | Potential national savings |
| Diabetes | 214 061 € | 32 388 € | 181 673 € | 5 849 870 € |
| Glaucoma | 163 289 € | 0 € | 163 289 € | 5 257 906 € |
| Macular Degeneration | 190 214 € | 0 € | 190 214 € | 6 124 891 € |
| Cataracts | 398 743 € | 0 € | 398 743 € | 12 839 524 € |
| Total | 966 307 € | 32 388 € | 933 919 € | 30 072 191 € |

| Pohjois-Savo, a medium hospital district 250 000 inhabitants (multiplier 32.2) | | | | |
|---|----------------------|---------------------------|---|----------------------------|
| | Actual current costs | Alternative current costs | Potential savings for the hospital district | Potential national savings |
| Diabetes | 345 759 € | 44 213 € | 301 546 € | 6 694 321 € |
| Glaucoma | 602 490 € | 0 € | 602 760 € | 13 375 278 € |
| Macular Degeneration | 179 534 € | 0 € | 179 534 € | 3 985 655 € |
| Cataracts | 242 100 € | 0 € | 242 100 € | 5 374 620 € |
| Total | 1 369 883 € | 44 213 € | 1 325 670 € | 29 429 874 € |

| Pirkanmaa, a large hospital district 530 000 inhabitants (multiplier 10.4) | | | | |
|---|----------------------|---------------------------|---|----------------------------|
| | Actual current costs | Alternative current costs | Potential savings for the hospital district | Potential national savings |
| Diabetes | 852 871 € | 130 449 € | 722 422 € | 7 513 189 € |
| Glaucoma | 1 188 742 € | 0 € | 1 188 742 € | 12 362 916 € |
| Macular Degeneration | 775 410 € | 0 € | 775 410 € | 8 064 264 € |
| Cataracts | 639 782 € | 0 € | 639 782 € | 6 653 733 € |
| Total | 3 456 805 € | 130 449 € | 3 326 356 € | 34 594 102 € |

Finland has a nationwide, comprehensive network of 687 optician shops (31.12.2021), even in small towns. In addition, many private medical centres have access to ophthalmologists, and some also have access to optometrists. Private providers already provide 80 % of all eye care services. (NÄE ry 2022) Optical shops can provide vision and eye care services cost-effectively. A significant part of the services can be financed by the client's co-payment, equivalent to the public health client fees, generally around 40€ or 21€ depending on the level of care. The cost-effectiveness of optician shops is made possible by the combination

of market-based product sales and healthcare in the shops, which allows optometrists and ophthalmologists to provide services profitably, even in small places. (NÄE ry 2020)

2.10 Public Healthcare in Lapland

2.10.1 Healthcare in Lapland – Current Situation and Future Challenges

Lapland is a large region, covering almost 30% of Finland's total area. However, Lapland has only 175 795 inhabitants (The Regional Council of Lapland 2023a), only 3% of Finland's population (Statistics Finland 2023e). The population density in the Lapland Wellbeing Services County is the lowest of all the Wellbeing Counties in the country. On average, in Finland, the population density is 18 inhabitants per square kilometre, while in Lapland, it is two inhabitants. By comparison, Helsinki alone provides social and healthcare services in the region and has a population density of just over 2 900 inhabitants per square kilometre. (Association of Finnish Municipalities 2023) Public services are more expensive to provide in areas of low population density than in densely populated areas. In low-population density areas, more operational units and staff are needed to provide adequate services to all residents. This increases the average unit cost of a unique service process. Smaller localities face challenges in attracting skilled labour, so one of the incentives is to pay higher-than-average salaries. In addition, long distances from the patient's home to a central hospital providing specialized care prolong the number of days spent there. These factors, among others, increase social and healthcare expenditures and pose challenges to the equitable provision of services in Lapland, which is sparsely populated and covers almost one-third of Finland's total area. (Häkkinen et al. 2022)

In addition, Lapland faces two significant challenges – population decline and ageing – which affect public services such as healthcare. The number of Lappish people has decreased significantly over the years. In 1993, 202 935 citizens lived in Lapland. By the end of 2022, the population had already reduced to 175 795 inhabitants, a 13 % decrease in 30 years. Like the population in Finland as a whole, the people of Lapland are always ageing. In 1990, 11 % of Lapland's population was over 65 years old, compared to 25 % in 2020. In Finland, 23 % of citizens were over 65 years in 2020. (The Regional Council of Lapland 2023a, Statistics Finland 2023c)

Lapland is a top-rated tourist destination. The region's fell resorts, in particular, have been trendy for many years. Traditionally, domestic tourism has been concentrated in the skiing season and spring. This millennium has significantly increased year-round tourism, especially international tourism to Lapland. In 2000, 1.1 million overnight stays by domestic tourists and 580 000 overnights by foreign tourists were

recorded, totalling about 1.7 million overnight stays. Before the Covid-19 pandemic in 2019, the number of overnight stays registered already reached 3.1 million, of which international tourists accounted for 1.6 million, 52 %. (The Regional Council of Lapland 2023b) For example, Levi, the biggest fell resort in Lapland, already has 25 000 beds and is visited by 750 000 tourists annually (Visit Levi 2023). Levi is located in Kittilä, with a population of 6 523 inhabitants (2021). (Statistics Finland 2023e) Lapland's healthcare services are sized to the people living in the area, so the increasing tourism poses challenges to the organization of health services. Tourists mainly need emergency services due to injuries caused by accidents and sudden illnesses.

Lapland Wellbeing Services County has provided health, social and rescue services in the region since January 1 2023 (Laki Sosiaali- ja Teveydenhuolto- ja Pelastustoimea koskevan Uudistuksen Toimeenpanosta ja sitä koskevan Lainsäädännön voimaantulusta 616/2021). Lapland is divided into four areas of action due to the total size of the region. The areas of operation are Northern, Eastern, South-Eastern and South-Western Lapland. Every municipality in Lapland has primary health care services. There are 28 health centres or stations, and the in-patient wards can be found in 18. These activities can be combined within the areas, for example, by closing a small unit during the summer holidays and transferring patients to another unit. 24-hour on-call services are available at Lapland Central Hospital (Rovaniemi), Mehiläinen Länsi-Pohja Oy's hospital (Kemi) and Ivalo Health Centre. On-call services are available at 17 health centres in other localities on weekdays during office hours, with on-call services also available in Pello on Saturdays and in Sodankylä every day from 8 a.m. to 9 p.m. (Lapha 2023)

In Lapland Central Hospital, general emergency examinations and treatments are available actively after office hours in the following specialities: general physician anaesthesia and intensive care, radiology, internal medicine, paediatrics, surgery and gynaecology. Furthermore, besides the specialities mentioned above, there is an emergency service known as backup physicians for neurology, pulmonary diseases, orthopaedic surgery, gastroenterology, and psychiatry. Cardiology and oral health care are available on an emergency basis. In addition to general medical emergency service, Mehiläinen Länsi-Pohja Oy provides active examinations and treatments after office hours on anaesthesia and intensive care, surgery and gynaecology. Back-up outpatient services are provided in radiology, internal medicine, paediatrics, orthopaedics, gastroenterology and psychiatry. There is no ophthalmology emergency service at either of the two central hospitals in the Lapland Wellbeing Services County region. (The Wellbeing Services Counties of The Kainuu, Central Ostrobothnia, Lapland, and Northern Ostrobothnia 2023).

Finland is divided into five collaborative areas, each with a university hospital. Oulu University Hospital (OYS) is responsible for the most demanding and emergency care in many specialities in the Kainuu, Central

Ostrobothnia, Lapland, and Northern Ostrobothnia wellbeing services counties. (Ministry of Social Affairs and Health 2023) The Oulu University Hospital provides emergency services in several specialities to northern Finland's four wellbeing services counties. OYS has an active and- /or backup service for all medical specialities except pulmonary diseases. (The Wellbeing Services Counties of The Kainuu, Central Ostrobothnia, Lapland, and Northern Ostrobothnia 2023)

Private healthcare facilities can be found in most of the major municipalities in Lapland. For example, Terveystalo has ten medical centres in Lapland, Mehiläinen four and Pihlajalinna four. In addition, there are small private healthcare providers in Lapland where general practitioners' services are available. These figures do not include units providing only occupational health services. (Terveystalo 2023, Mehiläinen 2023, Pihlajalinna 2023)

Specialist medical care services will be provided at Lapland Central Hospital in Rovaniemi and Mehiläinen Länsi-Pohja Oy's hospital in Kemi. Länsi-Pohja Hospital District outsourced specialized healthcare services to Mehiläinen Länsi-Pohja Oy in December 2017. The outsourcing contract was transferred to Lapland Wellbeing Services County. Mehiläinen Länsi-Pohja Oy will be responsible for specialist healthcare services in the Meri-Lappi region until 2032. (Mehiläinen Länsi-Pohja (2023a)

2.10.2 Public Eye Clinics at Lapland

Lapland has two public eye clinics: Lapland Central Hospital's Eye Clinic at Rovaniemi and Mehiläinen Länsi-Pohja's Eye Clinic at Kemi. Both public Eye Clinics in Lapland are referral clinics providing services only during weekday office hours. They do not offer emergency services after office hours, weekends, or holidays. Cataract surgeries and minor eye surgeries are made in the day surgery unit. More demanding operations like retina surgery are made at Oulu University Hospital. (Lapland Central Hospital 2021a, Mehiläinen Länsi-Pohja 2023b)

Eye Clinic at Lapland Central Hospital, Rovaniemi, treats patients based on referrals from primary healthcare and private ophthalmologists. In addition to the essential examinations by ophthalmologists and nurses, the outpatient clinic also operates a strabismus clinic, performs injections for the treatment of macular degeneration and performs laser surgery, such as removal of posterior capsule opacification and the laser treatment of retinal blood vessels caused by diabetes. Cataract surgery, eyelid surgery and minor surgical procedures are performed in the Day Surgery Unit. The Eye Clinic employs 12 nurses, one of whom is an optometrist. The optometrist currently works as a nurse. According to Juho Latvala, head physician at the Eye Clinic, there are plans to use the skills of an optometrist working in the clinic, for example, to examine

children's vision. There are 2.45 ophthalmologists and two physicians specializing in ophthalmology. Most of the ophthalmologists are working part-time in addition to their private practice. (Latvala, J. 2023)

According to the statistics 28.2.2023, 188 patients were waiting for an assessment of their need for treatment at Lapland Central Hospital's Eye Clinic, with an average median waiting time of 34 days. The exact figures for the Mehiläinen Länsi-Pohja's Eye Clinic were 209 patients with an average waiting time of 26 days. The average waiting time is the median, the middle value of the ranked observations. At the Lapland Central Hospital's Eye Clinic, there were 325 patients, and at the Mehiläinen Länsi-Pohja's Eye Clinic, 158 patients were waiting to start treatment. At both clinics, the average waiting time was 46 days. (Lapland Central Hospital 2023, Mehiläinen Länsi-Pohja 2023c)

In the case of cataract surgery, it has been possible to shorten the waiting lists at both eye clinics in Lapland Wellbeing Services County. In 2022, 660 patients were operated on at Lapland Central Hospital, with an average waiting time of 101 days. On March 31st 2023, 167 patients were on the waiting list, with an average waiting time of 39 days. At Mehiläinen Länsi-Pohja, 143 patients were waiting for cataract surgery on March 31 2023, averaging 46 days. The average waiting time for patients operated on January - March 2023 was 83 days. (Lapland Central Hospital 2023, Mehiläinen Länsi-Pohja 2023c)

A voucher for glaucoma follow-up examinations has been used in the Lapland Hospital District for several years. Regardless of the social and healthcare reform, the voucher will continue in the Lapland Wellbeing Services County. The voucher aims to increase the patient's freedom of choice, streamline access to examinations and reduce the number of glaucoma examinations at the public eye clinic. In addition, this voucher scheme will allow the resources of the eye clinic to be redirected to more demanding procedures such as eye surgery and treatment of macular degeneration. Glaucoma patients receive the voucher once a year, and they can choose to be examined at the hospital eye clinic or by a private ophthalmologist. Ophthalmologists providing glaucoma examination services must be a member of the voucher scheme. (Lapland Central Hospital 2021b)

2.10.3 Ophthalmology Emergency Care in Lapland

The Wellbeing Services County of Lapland provides primary health care on-call services outside office hours in Rovaniemi, Kemi and Ivalo. Those units do not have on-call ophthalmology services. Patients on call are treated at Oulu University Hospital if urgent care is necessary. Regardless of the time of the day, patients on call must go to the emergency care unit of the health centre, where general practitioners are on call. Suppose the general practitioner determines that the patient needs urgent treatment. In that case, they can

refer the patient to the public hospital's eye clinic during office hours, either in Rovaniemi or Kemi. Outside office hours, the general practitioner may consult the ophthalmologist on duty at Oulu University Hospital and, if necessary, refer the patient to Oulu for examination and treatment. (The Wellbeing Services Counties of The Kainuu, Central Ostrobothnia, Lapland, and Northern Ostrobothnia 2023)

If the patient has to be sent to Oulu University Hospital, they will be transferred there by ambulance or taxi, depending on the situation. The patient does not have to pay the travel costs. Kela pays travel expenses. Kela has a procurement with Suomen Lähilogistiikka Oy, which currently handles the transport of patients by taxi in the Wellbeing Services County of Lapland. According to the 2023 price list, a basic fee of 5.15 € per transport is charged on weekdays from 6 a.m. to 8 p.m. and on Saturdays from 6 a.m. to 4 p.m. At other times, the basic fare is 7.90 € per transport. The fare is 1.41 € / km for one to four passengers and 1.81 € / km for more than four passengers or carriages in stretchers. In addition, an assistance fee of 13.79€ will be charged if the passenger has to be assisted either from the pick-up point to the car or from the vehicle to the interior of the place of delivery, and the transport has required an invalid taxi or an accessible vehicle. If, in addition to the above, the driver has to carry the patient either manually or using a particular stair climber, or if the client has been assisted on a stretcher and the transport of the client has required a stretcher-equipped vehicle, an assistance surcharge of 26.412€ will be charged. (Suomen Lähilogistiikka Oy 2023)

Wellbeing Services County of North Ostrobothnia (POHDE) funds Oulu University Hospital (OYS). POHDE will bill the patient's wellbeing services county for its services if the patient is not from that region. Different rates are set for various procedures. For ophthalmology, the price of an operation performed during the on-call hours is calculated by multiplying the basic fee by 1.3. If the patient's case is resolved solely by consulting an ophthalmologist on call, POHDE will charge according to the time spent. For a regular consultation of 20 minutes outside office hours, POHDE charges 91€; for an extensive consultation of 20-40 minutes, 174.20€; and for a particularly extensive consultation of more than 40 minutes, 367.90€. (The Wellbeing Services County of Northern Ostrobothnia 2023)

The patient's first visit, an essential examination at the OYS ophthalmology outpatient clinic, costs 116€ for the patient's wellbeing service county. If the visit takes place outside office hours, the cost is 150.80€. If the visit requires several examinations, such as an OCT examination and the ophthalmologist's examination, the total cost is 309.40€. (The Wellbeing Services County of Northern Ostrobothnia 2023)

2.10.4 Private Eye Healthcare in Lapland

Lapland has 36 private eye care services, of which 30 are optical stores. The other service providers are private medical centres. All optical stores have optician services, and 55 % of them also offer the services of an optometrist. In addition, 73% of optical stores have an ophthalmologist's clinic. Private eye surgery is currently only offered at the Silmäsairaala in Rovaniemi. There is at least one optical store in Ivalo, Kemi, Kemijärvi, Kittilä, Muonio, Ranua, Rovaniemi, Salla, Sodankylä, Tornio and Ylitornio. (Valvira 2021). More than 80% of the total population of Lapland lives in these municipalities (Statistics Finland 2023e).

3 THE PURPOSE, OBJECTIVES AND TASKS OF THE RESEARCH DEVELOPMENT WORK AND THE DIFFERENT STAGES

3.1 Purpose of the Study Statement

This study aims to demonstrate that Finnish optometrists have the skills to act as primary eye care providers and that the current state of eye healthcare in Finland requires a new division of labour to meet the healthcare challenges of an ageing population.

3.2 Statement of the Research Question

Can an optometrist act as a primary examiner in eye health cases in Finland?

3.3 Summary Description of the Experimental Design

The study was conducted through a clinical case study and literature review.

This single case study report involved the clinical assessment and management of a seventy-three-year-old Caucasian female called to a privately owned optical shop because of a visual problem in the eye. The survey was based on one examination visit and consultation with an ophthalmologist on March 6th, 2023. This was a single case study, and the researcher collected all data anonymously on-site while the patient was seen at the practice. Therefore, a separate IBR approval was not needed. A separate confidentiality agreement was not made with the patient being studied, as the optician's shop where the study was conducted complies with the GDPR. The research method was qualitative. The case study is only an isolated case and cannot be used to draw generalized conclusions, but it provides evidence that optometrists can act as primary eye health examiners.

The literature review examined the state of optometry in Finland and compared it with the situation in Sweden, Norway and other European countries. In addition, open sources were used to examine the state and future challenges of the Finns healthcare system, especially eye care. The largest wellbeing services county, The Wellbeing Services County of Lapland, was used as a regional example.

This project was done for the Finnish Association of Vision and Eyecare (NÄE Ry). The partner was Brilllet, where the examinations were carried out.

3.4 Specific Aims

3.4.1 Specific Aim 1

To conduct a literature review to determine the level of Finnish optometry and optometric education and legislation compared to Sweden and Norway and, more generally, to the European level.

3.4.2 Specific Aim 2

To conduct a literature review to describe the Finnish healthcare system, specifically the vision care system, and the challenges in eye healthcare. The literature review will focus on the Wellbeing Services County of Lapland as a regional example.

3.4.3 Specific Aim 3

To present through a case study how an optometrist can treat an on-call patient using an evidence-based clinical approach.

3.5 Methodology

3.5.1 Literature Search

The literature review aimed to identify the current situation and existing and future challenges of optometry and eye healthcare in Finland. There is no scientific research on the topic in Finland. Hence, Google searches led to the use of national grey literature sources such as legislation, official statistics, and university curricula from Finland, Sweden, Norway, and Europe. The most recent data from the grey literature available on May 8, 2023, was sought.

PubMed was also used as a database. The studies searched via PubMed had a time interval of twenty years and consisted of article types, systematic reviews, and reviews. The search terms were ageing, visual acuity, cataract, and eye health care expenditures. Out of those, the most relevant studies were selected. The surveys were collected in January 2023.

Additionally, questions were conducted by email to five persons to have a database for the literature review. The CEOs of the optometry associations in Finland, Sweden and Norway were selected to answer the questions and provide information on the state of optometry in each country. Information on the state of public eye healthcare in Lapland was obtained from the CHIEF physician of the Lapland Central Hospital Eye Clinic. In addition, information was obtained by email from The National Supervisory Authority for Welfare and Health (Valvira) on the number of optometrists and ophthalmologists in Finland.

The references used were in Finnish, English, Swedish and Norwegian.

3.5.2 Clinical Settings

The case study was done in a privately owned optician shop, Brillat, in Rovaniemi. An optometrist assessed the patient over the phone and referred for an examination on the same day. The patient's eyes were microscoped using a Takagi slit-lamp microscope. The fundi were imaged, and OCT scans were performed on a Topcon Maestro 2. Eye pressures were measured with the iCare tonometer.

3.6 The Confidentiality

The confidentiality agreement was not made. The examinations related to the case were carried out in a private clinic, Brillat, which follows the European GDPR, Act on the Electronic Processing of Client Data in Healthcare and Social Welfare and Act on Status and Rights of Patients.

4 IMPLEMENTATION OF THE RESEARCH DEVELOPMENT WORK

4.1 Specific Aim 1

To find out the level of Finnish optometry and optometric education and legislation compared to Sweden and Norway and, more generally, to the European level.

4.1.1 Methods

The level of optometry in Finland, Norway and Sweden was researched by looking at optometric training, legislation and the state of eye care in those countries. Then, that information was compared at a general level to the other European countries.

4.1.2 Results

An optometrist is a licensed healthcare professional, and Finnish optical stores and optometric clinics are licensed private healthcare providers in Finland. In addition, the results of healthcare examinations provided by optometrists are recorded in the Kanta service. Furthermore, optometrists have compulsory continuing education, so they must maintain their skills like other healthcare professionals. The register of continuing training points is publicly available to all on the webpage. (Act of the Health Care Professionals 559/1994)

Seven of the 31 European countries are at the second highest level in the WCO Competency Model, category 3 with diagnostic drugs. These seven countries include Finland, Sweden and Norway. Only the United Kingdom is at the highest level in Europe. The difference between categories three and four is that in category 4, optometrists can prescribe therapeutical medicines. (ECOO 2020)

There are differences in optometrist legislation between the three Nordic countries, Finland, Norway and Sweden. In Finland, the prescription of spectacles is restricted by law. Opticians and optometrists are not allowed to independently prescribe eyeglasses to a person who has or is suspected of having an eye disease, has had eye surgery or is under eight years old. The law requires a physician to prescribe eyeglasses in such cases or to authorize an optician/optometrist to prescribe glasses for that person. There is no similar legislation in Sweden and Norway. (Valtioneuvoston Asetus Terveystieteiden ammattihenkilöistä 564/1994) .In these countries, the optician/optometrist must refer the patient to the appropriate physician if the patient's eye or other health condition requires it. However, this does not prevent the independent prescribing of eyeglasses. (Brautaset 2022, Haugo 2022)

A significant difference between those three countries is that Norwegian and Swedish optometrists have a referral right. They can refer the patient directly to a public eye clinic or hospital. According to the ECOO Blue Book 2020, optometrists in 17/31 European countries have that referral right. The referral right is written into the law in all Category 3 and 4 countries except Finland, Denmark, and Spain. In the latter two countries, however, a referral is standard practice. Finnish optometrists do not have that kind of right. In Finland, optometrists have to recommend the patient go to a private ophthalmologist, who can refer the patient to the public healthcare unit. (ECOO 2020)

In principle, all working Norwegian optometrists have the right to use diagnostic drugs. In Finland, the corresponding proportion is about 73 % of the profession. Swedish optometrists have been allowed to use diagnostic medications since 2016, so the number there is still relatively low, with less than 20 % of optometrists having this right. (Brautaset 2022, Haugo 2022)

Twenty-three European countries have a Bachelor's degree in optometry, and fifteen have a Master's degree also. In addition to Sweden and Norway, nine countries offer a PhD in optometry. (ECOO 2020) There are five optometry training institutions in Europe whose training programmes are accredited by the ECOO as equivalent to the European Diploma in Optometry. In Finland, Metropolia University of Applied Sciences has already passed two of three levels required for accreditation, and Oulu University of Applied Sciences is well advanced in the accreditation process. (ECOO 2023)

In Sweden and Norway, a Bachelor's Degree in Optometry is 180 ECTS; in Finland, it is 210 ECTS. (Karolinska Institutet 2023a, Metropolia University of Applied Sciences 2023, Oulu University of Applied Sciences 2022a, University of South-Eastern Norway 2023a)

Master's Degree education in optometry started in 2020 in Finland, so there are only a few optometrists with a Finnish Master's Degree at the moment. (Oulu University of Applied Sciences 2022b) However, some Finnish optometrists have studied abroad, for example, in Norway, the United Kingdom and the United States. In Sweden, around 180 optometrists have a Master's Degree in optometry (Socialstyrelsen 2023).

4.1.3 Discussion

In terms of skills and legislation, the level of Finnish optometry is excellent compared to the European average. Legally, optometrists are licensed healthcare professionals. Most of them work in optical stores, which are licensed healthcare providers. This means that the optometric profession is supervised by the authorities, National Supervisory Authority for Welfare and Health (Valvira) and Regional State

Administrative Agencies (AVI). Therefore, Finnish optometry is regulated by the same legislation as other private healthcare and healthcare professionals.

The lack of referral rights is a significant factor affecting the patient care of optometrists. This is especially true in urgent and emergency cases, as it can slow patients' access to treatment. To have a referral to the public eye clinic, the patient has to go either to an ophthalmologist in private practice, to a general practitioner in a health centre, or to urgent and emergency cases to primary care on-call services. Such a complex treatment pathway prolongs access to appropriate care, increases costs and burdens the healthcare system. In addition, optometrists have knowledge and examination equipment to identify eye diseases and assess the urgency of treatment. The same eye health expertise and equipment are unavailable in primary care health centres and outpatient clinics.

The law on optometrists' right to use diagnostic drugs, which entered into force in 2011, was a significant change for the rights of Finnish optometrists and their practice. Today, all graduating optometrists have these rights, and many of those who have graduated earlier have also acquired these rights through additional training. A significant improvement is not just the right to use diagnostic medicines, but optometrists must study eye health and its examination to obtain them.

Bachelor's level education is high in our country, as evidenced by the ECOO accreditations. However, the accreditations of Oulu University of Applied Sciences and Metropolia University of Applied Sciences are still conditional. There are only five universities accredited by ECOO in Europe. Compared to the relatively small number of accredited institutions and the near completion of two Finnish institutions, Finland's level of education in optometry is high.

Before 2020, no postgraduate optometric training in Finland has led to a degree in optometry. The only way optometrists have been able to upgrade their skills is through further training. A Master's degree in clinical optometry creates a profession above Bachelor-level optometrists. Graduates with Master's degrees have more expertise in ophthalmology and therapeutic drugs, for example. In addition, the Master's thesis work carried out alongside the studies will create new research optometric knowledge in Finland. Raising the level of training is essential for developing optometry in Finland. This will further emphasize optometry's role as an independent branch of science.

4.2 Specific Aim 2

To describe the Finnish healthcare system, specifically the vision care system, and the challenges in eye health care. The literature review will focus on the Wellbeing Services County of Lapland as a regional example.

4.2.1 Methods

The Finnish healthcare system and eye care were studied by looking at the relevant legislation, the social welfare and healthcare reform that entered into force on January 1st 2021, and public healthcare statistics on eye care professionals, access to care, visits and costs.

4.2.2 Results

In Finland, as in other developed countries, the ageing of the population is significant. It is affected by low fertility rates, which in Finland were the lowest in 150 years in 2022, and by steadily increasing life expectancy (Statistics Finland 2023a). Life expectancy at birth for baby boomers born after the Second World War was 58.42 years for men and 65.84 years for women. Life expectancy for boys born in 2022 was almost 20 years higher (78.63 years) than for baby boomers. For girls born in the same year, life expectancy increased by nearly 18 years to about 70 years. (Statistics Finland 2023b)

Due to low birth rates and longer life expectancy, the share of the senior population in the total population will increase significantly in the coming years. In 2030, 26.2 % of Finland's population is projected to be over 65. At the turn of the millennium, the corresponding figure was 15 %. This trend will lead to a deterioration in the demographic dependency ratio. A smaller and smaller share of the population will be of working age, increasing the size of the public economy. (Statistics Finland 2022)

As the population ages, the need for health services increases. Statistics also show the senior population has a significantly higher demand for health services than younger people. According to a study published by the Finnish Institute for Health and Welfare (THL) in 2014, healthcare expenditure for people aged 65 and over accounted for 45.8 % of all public healthcare costs in Finland in 2011 (Kapiainen, Satu & Eskelinen, Janne 2014). This is another reason why population ageing is a burden on the public economy. Furthermore, due to the ageing population, social welfare and healthcare expenditure will increase significantly in the coming years. According to the Ministry of Finance calculations, the cost will increase by 25 % by 2030 (Ministry of Finance 2023a).

The social and healthcare reform occurred in Finland on 1 January 2023. The aim of the reform, which has been a long time in the making, has been to improve cooperation between primary care and specialist care and to curb the increase in social welfare and healthcare costs due to the ageing population. As a result of the reform, 22 Wellbeing Services Counties and the City of Helsinki took responsibility for organizing social welfare and healthcare in their areas. Previously, responsibility lay with municipalities and joint municipal authorities. The wellbeing services counties receive budget funding from the state and have no right to tax. (Government. 2022)

The Covid 19 pandemic already increased long waiting times for primary and specialist care access. Access to treatment in both primary and specialized care is regulated by law in both primary and specialized care. This law is being tightened in stages. The first amendment will be enacted on 1 September 2023 and the second on 1 November 2024. Under current legislation, in primary care, non-urgent care must be assessed within three days, and the patient must have treatment within three months. From 1 September 2023, the need for treatment must be assessed within the same day of the patient's contact. Under the new amendment, access to treatment must be within 14 days, which will be tightened to seven days from 1 November 2024. There will be no changes to the guaranteed periods of care for specialized care. (Health Care 1326/2010 Amendment 19.1.2023)

In Finland, public eye care services are only available at the specialized hospital level. A common way to deal with eye health issues is to go to an ophthalmologist in private practice, as getting to the public side is challenging. From 1 January 2023, the KELA reimbursement for private eye examinations is reduced to eight euros, only 4 - 8 % of the fee an ophthalmologist charges (KELA 2022).

In eye healthcare, treatment queues are the second biggest of all specialities. Cataract surgery is the most frequently awaited procedure. (THL 2023e) The prevalence of the most common eye diseases, cataracts, age-related macular degeneration, glaucoma and diabetic retinopathy increases significantly with ageing. The ageing of the population will, therefore, considerably increase the need for eye care services in the coming years. (Laitinen, A., Laatikainen, L., Härkänen, T., Koskinen, S., Reunanen, A. & Aromaa, A. 2009)

A significant proportion, around 70 % of ophthalmologists of working age, are either partly or wholly employed in the private sector. As a result, there is a shortage of ophthalmologists in public eye care, which further increases waiting lists. (Sallinen, Eeva 2023)

It is still common in various European countries for vision and eye health examinations to be fully or partially reimbursed by society if the examiner is an ophthalmologist. However, in many countries, no such

reimbursement is made for an examination carried out by an optometrist. For example, in Finland, public funds reimburse optometrists for vision examinations if the patient is visually impaired or receives social welfare financial support. In addition, some municipalities have paid for vision examinations of schoolchildren by optometrists. (ECOO 2020)

Public health services make limited use of the expertise of optometrists in Finland. In recent years, optometrists have been employed in hospital eye clinics, where they mainly perform auxiliary examination activities to support the work of ophthalmologists. The skills of optometrists working in the private sector are not exploited except in eye examinations for schoolchildren. Optometrists' skills are not used in eye health examinations, even if their training and skills would allow it. (Tast, Panu 2023)

According to the Finnish Association of Vision and Eyecare's (NÄE) calculations, about 15 %, about 30 million euros of public eye care in Finland, can be saved annually if private eye care providers are included (NÄE ry 2020). This would lead to significant savings and enable services to be provided in a high-quality manner, closer to the patient. This is particularly important in Lapland, where distances between localities are long, and many Laplanders must travel a long way to a central hospital.

The challenge with the calculations is that they are based on the current situation and do not consider the increasing healthcare expenditure due to an ageing population. In addition, the figures are calculated using rough examples. But despite these, the calculations can be considered reliable as an indication of the magnitude of the potential savings.

In the 2020 calculations, one example was the Kymenlaakso Hospital District, which has a population of around 160 000. Lapland has just under 180 000 inhabitants, so the figures for Kymenlaakso are comparable with Lapland. The calculations do not consider travel costs to public healthcare, which KELA partly covers. These add significantly to the healthcare expenditure in Lapland. If calculated according to the Kymenlaakso example, savings of around 1 million euros could be achieved in Lapland using private eye care providers. (NÄE ry 2020)

According to the Eyewear Use and Vision Correction- survey, 39 % of Finns get eyeglasses on prescription from an ophthalmologist. Of these, 69 % went directly to an ophthalmologist, and 31 % were referred by an optician/ optometrist. (NÄE ry 2022a) The current legislation prevents all people needing eyeglasses from undergoing an optician/optometrist examination. Opticians/optometrists cannot independently prescribe eyeglasses to a person who has or is suspected of having an eye disease, who has had an eye operation, or who is under eight years old (Valtioneuvoston Asetus Terveysthuollon Ammattihenkilöistä 564/1994).

Around 50 000 cataract operations are performed in Finland annually (THL 2023f). For example, they all have to visit an ophthalmologist after the operation to get a new prescription for eyeglasses.

Another remarkable factor contributing to the workload of ophthalmologists in private practice is the lack of referral rights for opticians/optometrists. In Finland, opticians/optometrists are not allowed to refer patients directly to public healthcare services, but only physicians have that right. (Act on Specialized Health Care 1062/1989) For example, opticians and optometrists have referral rights in Sweden and Norway. They can refer patients to public eye clinics for further examinations, various surgical operations such as cataract surgery, and other medical specialities. (Brautaset 2022, Haugo 2022)

Cataracts, which develop with ageing in almost everyone, is a progressive eye disease treated only by surgery in a public hospital when the visual acuity in the better eye has fallen below 0.5 (Duodecim 2019). The optometrist has sufficient expertise to do this monitoring and, once the visual acuity meets the referral criteria, could write a referral directly for cataract surgery. This is how it is done in Sweden and Norway. In Finland, a referral from a physician is required, and most commonly, a referral is made by an ophthalmologist in private practice based on his examination. (Act on Specialized Health Care 1062/1989)

In Europe, only in the United Kingdom do optometrists have the right to prescribe therapeutic medicines (ECOO 2020). The Master's Degree in Clinical Optometry, which started in the autumn of 2020 at the Oulu University of Applied Sciences, includes a prescribing course equivalent to training Finnish nurses with limited rights to prescribe therapeutic drugs. (Oulu University of Applied Sciences 2022b)

Lapland's population size, in relation to the region's size, poses challenges for the organization of public services, such as healthcare. Providing adequate essential services is a challenge in the sparsely populated northern areas. This also poses economic challenges, as basic services must be provided in smaller localities to ensure citizens do not travel excessive distances to access services. An example of challenges of organizing services is that Lapland covers an area of 100 367 square kilometres, is 30 % of the total area of Finland, and has a population of 176 494 (2021). The City of Turku covers an area of 243 square kilometres and has a larger population than Lapland, just under 200 000 inhabitants. (Association of Finnish Municipalities 2023)

The social welfare and healthcare system reform has alleviated some of these challenges, as previously, the municipalities had to organize primary healthcare on their own, and the reform has placed the responsibility for this on the broader shoulder of the Wellbeing Services County of Lapland. (Government. 2022)

Long distances to specialized healthcare make access to care difficult, travel time is long, and travel costs are high. For example, Utsjoki, Finland's northernmost municipality, had 1 176 inhabitants in 2021. The distance from there to Rovaniemi, the nearest central hospital providing specialized healthcare services, is 454 kilometres, which takes about 5.5 hours one way by car. (Google Maps 2023)

An essential characteristic of Lapland, in addition to its low and declining population and sparsely populated area, is an ageing population, which increases the need for health services (The Regional Council of Lapland 2023a). In addition, international and domestic tourism to Lapland, especially in winter, significantly increases the demand for healthcare services (The Regional Council of Lapland 2023b).

Increasing tourism poses challenges for healthcare organizations, even if tourists pay for their services. For example, Levi in Kittilä can accommodate around three times as many tourists at one time compared to the municipality's population (Visit Levi 2023). Moreover, the seasonal nature of tourism in Lapland means that many seasonal workers are registered in other Finnish cities or abroad. Thus, they do not appear in the official population of the municipality concerned.

Due to the limited population base and economic issues, not all localities have access to emergency care after office hours, even at the general practitioner level. In addition to the region's two central hospitals, Lapland Central Hospital, Rovaniemi and Mehiläinen Länsi-Pohja, Kemi, round-the-clock emergency care are provided at Ivalo Health Centre. For many Laplanders, the journey to the doctor on duty is long after office hours and at weekends. (Lapha 2023)

Lapland Central Hospital and Mehiläinen Länsi-Pohja do not have on-call services for all medical specialities, including ophthalmology. Therefore, for acute eye problems that cannot be treated by the expertise of a general practitioner or lack of adequate equipment, an ophthalmologist on call at Oulu University Hospital (OYS) should be consulted. If the problem cannot be treated through consultation, the patient may have to be referred to OYS. This results in delays in treatment and costs and is inconvenient for the patient due to the long distances involved. (Lapha 2023)

The costs to society are considerable if the patient has to be referred to an ophthalmologist on call outside office hours at OYS. For example, an examination where a patient is sent from Rovaniemi to Oulu to see an ophthalmologist and, in addition to the examination by the physician, an OCT examination of the fundus of the eye is performed there. The total cost is 695.90€, of which 656.50€ are travel expenses (Suomen

Lähilogistiikka Oy 2023). The costs of the working time spent in the Lapland Central Hospital emergency must be added to this sum. The patient's co-payment for this treatment is 41.80€. (Lapha 2022)

Another way to deal with the above example would have been to refer the patient to an optometrist. The optometrist's expertise and examination tools, including OCT, would have enabled an assessment of the need for treatment and, if necessary, consultation with the ophthalmologist on call at the OYS. The ophthalmologist would thus have already had the results of the optometrist's examination in hand in the consultation request. This would have made diagnosing and starting treatment remotely easier than based on the general practitioner's examination. This would also be significantly cheaper, as the patient would not necessarily need to travel to Oulu. The costs would have been 25-45€ for the optometrist's examination, 50-79€ for the OCT examination, and 91 - 367.90€ for the consultation charged by OYS. The total cost would have been 166 – 491.90€. These calculations do not consider how the services of private optometrists are tendered and whether, for example, a voucher is available, in which case the prices are fixed. Optical stores do not have an optometrist on-call service 24 hours a day, so every patient can't have such a procedure. But opticians shops are open longer than 9-16 and are often open on Saturdays and some even on Sundays. (Brillet 2023, Instrumentarium 2023, Silmäasema 2023, Specsavers 2023, Synsam 2023, The Wellbeing Services County of Northern Ostrobothnia 2023)

4.2.3 Discussion

Finland's healthcare system is facing increasing challenges due to an ageing population. A primary objective of Social Welfare and Healthcare Reform has been to overcome these challenges. Due to ageing, the population's need for various healthcare services is constantly increasing. As a result, healthcare costs will also rise in the coming years. On the other hand, the change in demographic dependency ratio to ageing poses significant challenges for financing public services as the proportion of the population in employment declines.

The number of working taxpayers steadily decreases due to an ageing population and an increasing dependency ratio. The decline in taxpayers will pose growing challenges to public finances. If current levels of public services are to be maintained, including healthcare, the burden on the declining working taxpayer will increase significantly without substantial labour migration or structural reforms to public economics.

Social welfare and healthcare reform have aimed to lower the barriers between primary and specialist care and make it easier for citizens to access care. A critical objective of the reform is to curb the rising social welfare and healthcare costs due to an ageing population. Previously, municipalities were responsible for organizing social welfare and healthcare services individually or through associations of cities, which posed

significant challenges, especially for small and sparsely populated municipalities, many of which have a significantly high average age. The reform makes it easier to organize services when a substantially larger entity than the municipality is responsible.

Ophthalmology is an excellent example of a medical speciality where the general challenges of healthcare are very recognizable. The prevalence of the most common eye diseases, cataracts, glaucoma, age-related macular degeneration and diabetic retinopathy, increases significantly with age. The increase in the number and relative size of the senior age group compared to the population is putting increasing pressure on public eye care. Today, ophthalmology waiting lists are among the highest among all medical specialities. In addition, there is significant room for improvement in the division of labour between the eye care professions, optometrists and ophthalmologists.

The tightening of access to care times poses significant challenges for the Wellbeing Services Counties providing primary care. Again, eye health is an excellent example of an area where challenges are evident. Public healthcare does not provide eye health services at primary care but is only available at the specialist level. Primary care has neither the specialized expertise nor the examination equipment for ophthalmology, which poses real challenges in examining patients' eye conditions within the seven-day timeframe imposed by the tightening guarantee of care. The lack of eye care services at the primary care level puts pressure on specialist care, as all patients requiring specialist care must be referred to specialist care. As there are already long waiting lists for access to eye clinics in central hospitals providing specialist care, getting treatment within the prescribed timeframe can also be challenging. This problem is more pronounced in Lapland, where distances are long and public eye care is only available in Rovaniemi and Kemi and even in these units during office hours. For example, the distance from Utsjoki to Lapland Central Hospital, Rovaniemi, is 454 kilometres, and it takes about 5.5 hours to drive.

Like many other sectors in our country, healthcare faces labour shortages. Training of additional workers is slow, and the size of the shrinking working age cohorts limits the capacity to increase training. Labour immigration is one solution to the labour challenge but will not solve it quickly.

In eye care, the challenge is not so much of skilled labour but a distortion of the division of labour. The skills of optometrists, especially those working in the private sector, are not being utilized in practice as providers of eye care services. Similarly, the work of ophthalmologists in private practice is hardly used to complement public services, except at the patients' expense. This was further highlighted when the KELA reimbursement was reduced to a very low level compared to the fee charged by ophthalmologists from the beginning of 2023 onwards. The voucher for private glaucoma treatment in the Wellness Services County of Lapland is

the only treatment in this region where society contributes to the costs of the examination carried out by the ophthalmologist in private practice.

Finland has a nationwide, regionally comprehensive network of 687 (31.12.2021) optician shops offering the services of opticians and optometrists, and 70 % of the shops also provide the services of an ophthalmologist. Lapland also has an extensive network of optician shops. There are 30 shops and six private healthcare units providing eye care services. More than 80 % of Laplanders live in municipalities with at least one optician shop.

The prices of the services in these units are highly competitive and significantly lower than those of similar services provided by the public sector due to the competitive situation and the trade in products in those shops. Most of the services provided by an optician/optometrist can be provided for the same amount as a specialist outpatient clinic fee, so there would be no cost to society for the optometrist's essential examinations. In addition to lower examination costs, the extensive network allows services to be provided close to the patient, reducing time-consuming and costly travel. The opening hours of optician shops are also longer than those of public eye clinics in Lapland, which only operate during office hours.

According to calculations made by NÄE in 2020, it is possible to save more than 30 million euros in annual public eye care expenditure by involving private providers, optometrists and ophthalmologists in providing services. The combined potential savings are significant because they are based on calculations for the four most common eye disease groups, accounting for 15 % of annual total costs. In addition, using private providers would free resources in central hospital eye clinics to treat demanding eye diseases and for eye surgery. This would speed up access to treatment.

Optician shops have the expertise and examination equipment to consult an ophthalmologist if the patient's condition requires it. Even in a short timeframe, it is possible to consult an ophthalmologist on call in the public sector, for example, using existing communication tools. This speeds up the time needed to start treatment and avoids travelling to an eye clinic that provides on-call services.

Ophthalmologists in private practice use much of their working time examining vision and prescribing eyeglasses. Another area that occupies them significantly is writing referrals for specialist public care, such as cataract surgery. If all prescriptions were made by an optician/optometrist, the workload of ophthalmologists would be significantly reduced, freeing up their resources for treating actual eye diseases and eye surgery. This would reduce long waiting lists for treatments.

Removing the non-medical restrictions in the current legislation on the independent prescription of spectacles by opticians/optometrists would divert more spectacle wearers to optician/optometrist examinations rather than ophthalmologist examinations. In addition, granting referral rights to opticians/optometrists along the lines of Swedish and Norwegian models would reduce the workload of ophthalmologists, freeing up resources for examining and treating more demanding eye conditions and eye surgery. A third significant change would be to grant Master's Degree optometrists limited prescribing rights for therapeutic drugs, such as the most common eye drops for eye infections and allergies. In this way, easily identifiable and treatable eye conditions would not require specialist physician examination but would be treated by an optometrist. This is how primary care works today: trained nurses treating minor, localized inflammatory conditions.

Removing restrictions on prescribing spectacles, granting referral rights to all optometrists, and giving limited therapeutic prescribing rights to optometrists with a Master's Degree required a change in the law. These actions can potentially make the division of labour between eye healthcare professions more effective and better meet the challenges of organizing eye care in the coming years. An excellent example of how the model works is the situation in Sweden and Norway, where these rights, except for the right to prescribe therapeutic medicines, have been commonplace for many years. In these countries, the waiting lists for access to care are shorter than in Finland, and cooperation between eye care professionals works well.

Giving optometrists more rights would naturally increase the optometrist's responsibility for patient care. By European standards, optometrists are licensed healthcare professionals with extensive professional training and are subject to the same legislation as physicians and nurses. In addition, optometrists work mainly in optician shops, all licensed healthcare providers and where the examinations are transferred to the Kanta service. Optometrists are, therefore, ready to take on increasing responsibilities.

4.3 Specific Aim 3

To present through a case study how an optometrist can treat an on-call patient using their skills and examination tools.

4.3.1 Methods

This single case study presented how an optometrist, with a thorough eye health examination and OCT equipment at his disposal, can act as the primary eye health examiner in an outpatient eye health case.

4.3.2 Clinical Case Study

4.3.2.1 Anamnesis

A seventy-three-year-old Caucasian female called on Monday afternoon to an optician shop. The phone call was directed to an optometrist, who made a telephone assessment of the need for treatment based on the patient's report.

The chief complaint was reduced vision in the left eye, which had occurred the day before the call. When reading, she noticed a flash of light in her left eye, followed by a dark shadow in the visual field. At the time of the call, the patient felt that the central visual area of the left eye was missing. She experienced no other symptoms. On Sunday, the day of the incident, she had not been in contact with any health service because she had thought she would not be able to get appropriate treatment anyway.

Before calling this optometrist, the patient had visited another optician shop to report her condition, where she had been examined by an ophthalmologist less than six months ago. At this examination, there were no abnormalities in her eyes. This ophthalmologist and other ophthalmologists at the same shop had a hectic day and no time to examine the patient.

Based on a telephone conversation, the patient was advised to come for an examination on an emergency basis. As there was no ophthalmologist available at that optician shop, the patient was booked in for an appointment with an optometrist at the first available time, 15:00 on the same day, which was one hour later than the time of the telephone call.

Based on the history taken at the beginning of the examination, the patient had no other ocular or symptom complaints than the visual field defect in a central field of the left eye already reported on the telephone conversation. This was relatively easy to detect, and she could describe the defect's location and size. The patient had no previous history of eye disease. She reported having undergone corrective eye surgery for strabismus when she was under ten. She wears multifocal progressive spectacles with vertical strabismus corrective prisms, as prescribed on 15 June 2018. When prescribing these eyeglasses, her visual acuity was 0.8 on the right and 1.0 on the left. She has no general medical diseases and is not on any ongoing medication.

4.3.2.2 Clinical findings

On examination, the patient had a visual acuity of 0.8 in the right eye and less than 0.05 in the left. It wasn't easy to find the optotype on the eye chart.

The optometrist performed the visual field examination by sitting in front of the patient and asking the patient to cover the left eye. Then, the optometrist asked her to fix her gaze on the tip of the optometrist's nose and observe, without changing her gaze, whether she could see the examiner's face completely. There were no visual field defects in the right eye.

The visual field examination was repeated for the left eye in the same way, and the patient covered the right eye. She had real challenges focusing on the optometrist's nose in the left eye. The correct line of sight was sought through a collaborative effort between the optometrist and the patient. With the left eye, she could only detect the optometrist's left ear leaf when facing the patient from the optometrist's face. Otherwise, the whole face was covered by a dark shadow.

Next, the optometrist measured the patient's eye pressure with an iCare tonometer. The eye pressure was within the normal reference range in both eyes. They were 17/17 mmHg.

4.3.2.3 Examination

The optometrist started a slit lamp examination of the anterior part of the right eye, which showed nothing abnormal. There was also nothing abnormal in the anterior part of the patient's left eye. The cornea was clear, the anterior chamber was calm, and the lens was slightly cloudy, which is normal considering the patient is 73 years old. The chamber angles were four in both eyes using the Van Herick method.

After the microscopic examination of the anterior segment and measurement of intraocular pressure, the optometrist, based on his training and experience, concluded that it was safe to place a Tropicamide 5mg pupil-dilating drop in the patient's eyes.

Once the patient's pupils were sufficiently dilated, the optometrist examined both fundi of the eyes with a microscope and a Volk 90D fundus lens. The papillae of both eyes were physiological without any abnormalities. A few drusen were visible in the macular area of the right eye. A substantial swelling was visible in the macular area of the left eye.

Next, the optometrist performed a fundus image and OCT scan of both eyes with macular and papilla-centred images. In the right eye, there was a slight unevenness between the retinal pigment layer and Bruch's membrane in the macular area.

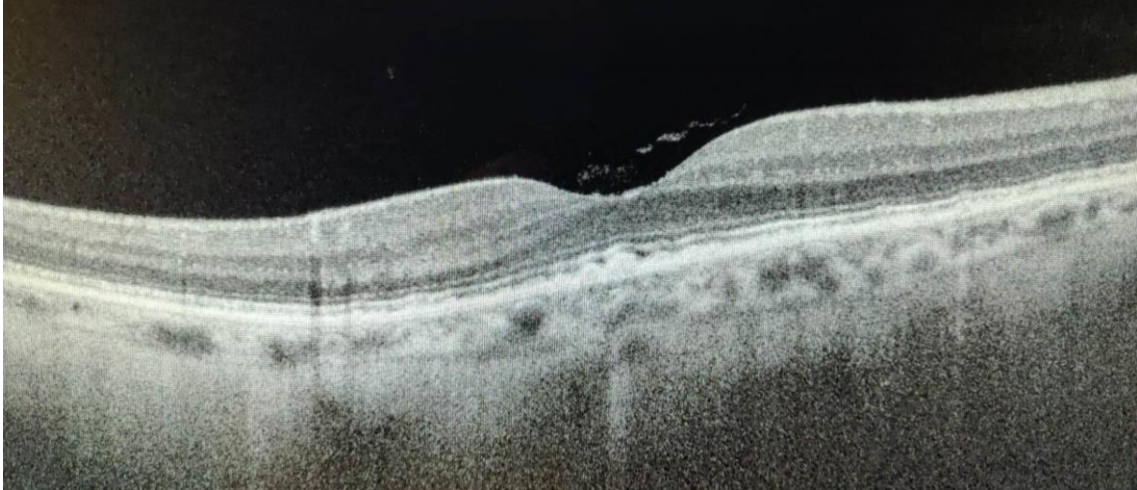


FIGURE 8. Macular OCT -scan from the right eye.

The left eye showed extensive haemorrhage on the retina, starting in the macular area and progressing downwards. The site was about three times the height of the papilla and twice as wide. An OCT image of the macular area showed extensive and significant swelling in the macular area under the retina. This explained the visual field defect in the left eye. The optometrist's diagnostic suspicion on examination was sudden wet macular degeneration. The differential diagnosis was a subretinal haemorrhage.

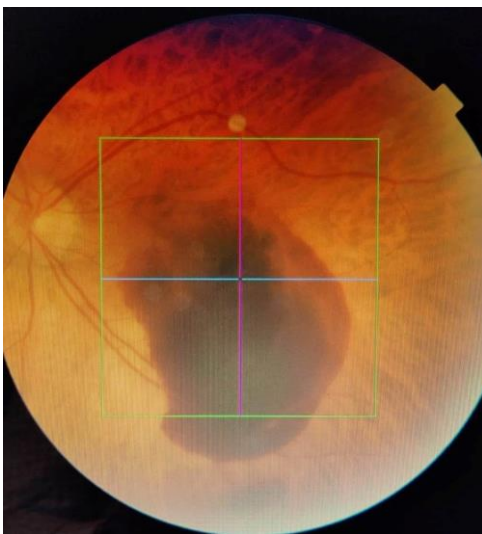


FIGURE 9. Retinal image from the left eye.



FIGURE 10. Macular OCT – scan from the left eye.

4.3.2.4 Diagnosis and treatment

Due to the loss of vision and the possibility of the area of deficiency spreading to a broader area, the optometrist decided that an urgent assessment of the need for further examination and treatment was required. He immediately consulted by telephone the ophthalmologist who had examined the patient six months earlier. During the call, the optometrist sent the patient's fundus and OCT images to the ophthalmologist without revealing the patient's name or other personal details.

After viewing the images, the ophthalmologist confirmed the diagnosis as wet macular degeneration in the left eye. At the same time, he explained that the treatment in such a case is anti-VEGF -intraocular injections, according to Current Care Guidelines (Duodecim 2017), and the treatment should be started within 1-7 days of the diagnosis, according to guidelines of the Lapland Central Hospital. Based on the patient's previous examination, the optometrist's assessment of the patient's current condition and the OCT- scans, the ophthalmologist referred the patient to the Eye Clinic of the Lapland Central Hospital with a degree of urgency 1-7 days. He further advised the optometrist to emphasize to the patient that she should also monitor the vision in the right eye with special attention. If there is any change in the right eye even slightly similar to that in the left, or if the condition of the left eye changes significantly, the ophthalmologist advises the patient to contact the ophthalmologist without delay.

The patient was waiting at the shop while the optometrist called the ophthalmologist. After the call, the optometrist told the patient the ophthalmologist's diagnosis and that a referral to the Central Hospital had been made. The optometrist also told the patient that the condition of the right eye should be actively and

regularly monitored. The optometrist taught the patient how to use the Amsler grid and instructed her to use it daily to check the central vision of the right eye. At the time of the examination, no distortions were visible on the grid when looking with the right eye. The patient was also instructed to monitor the condition of the left eye, paying attention to any changes.

The optometrist gave the patient his telephone number, which is available 24 hours a day, and promised the patient could be contacted at any time if there were any changes in her eyes or vision. This approach was agreed upon because of the challenges of accessing an ophthalmologist in Rovaniemi on an emergency basis. Through his examination and contacts, the optometrist might get the patient to treatment more quickly than if she were to contact the ophthalmological services herself.

4.3.3 Discussion

On Sunday, the day of the incident, the patient had not been in contact with the primary care emergency after noticing a vision loss in her left eye. She explained that the reason for not going to the emergency was the excessively long waiting time, which is common in an emergency in Lapland Central Hospital. She also thought the eye would not have undergone any necessary tests and treatments on Sunday.

If the patient had gone to the hospital on Sunday, the general practitioner on duty would have consulted the ophthalmologist on-call at the Oulu University Hospital. If the ophthalmologist on-call had not been sure of the diagnosis, he could have referred the patient to Oulu University Hospital for examination. The emergency department of the Lapland Central Hospital does not have, for example, an OCT scan available, which would have made the diagnosis easy, as the case shows to be possible. Even if the patient had gone to Oulu for examinations, the treatment would not have been started on the same day because, according to the guidelines of the Lapland Central Hospital, the intraocular injection treatment of wet age-related macular degeneration is started 1 – 7 days after diagnosis. For example, in the case of retinal detachment, which can often be treated. A delay in starting treatment could have meant permanent vision loss. In this case, the one-day delay had no impact on the outcome.

Because of the long waiting time, the patient did not go to the emergency room the following day, Monday, but tried to see a familiar ophthalmologist in private practice. Unfortunately, at this particular practice, the patient could not be examined, even though her symptoms required an acute examination.

Fortunately, the patient did not give up and called another optician shop, where the salesperson who answered the phone directed the call to an optometrist according to the instructions she had received. That shop's policy is that whenever a customer calls with a vision problem, one of the optometrists available is

called. This protocol ensures the correct information is given to the customer and that any assessment of treatment needs is appropriately done.

It is a challenge for optometrists, opticians and other staff working in optician shops to identify eye health conditions requiring acute care. Opticians and optometrists, in particular, must do this, thanks to their training. Optician shops also employ sales staff who have not been trained in healthcare. Therefore, It would be paramount to train sales staff to recognize the warning signs when a patient's case requires an acute examination by an optometrist or ophthalmologist.

This case is a single example of how an optometrist can act as a primary eye care provider with his expertise and examination tools, even in acute eye conditions.

4.4 Conclusions

This study shows the competence of Finnish optometrists and the level of training in optometry in Finland is relatively high compared to European standards. However, the public health sector does not make much use of the skills of optometrists, especially those working in the private sector. The Finnish eyecare system is based on public eye clinics providing specialist care and ophthalmologists in private practice. Some eye surgery, especially cataract surgery, is purchased by the public sector from private eye hospitals.

Healthcare will face increasing challenges in the future due to the ageing population and the growing demand for healthcare services. These challenges are both operational and financial. These challenges are particularly acute in eye healthcare as the incidence of the most common eye diseases increases significantly with ageing.

In the Wellness Services County of Lapland, the challenges for health care are compounded by an older population than in the rest of Finland, long distances, a sparsely populated region, and a significant increase in tourism. In addition, attracting sufficient numbers of competent healthcare personnel to Lapland has traditionally been a challenge. This is likely to become more acute in the coming years due to a nationwide shortage of health personnel.

Optometrists have the training and skills to act as primary eye care providers, allowing patients with eye health problems in primary public healthcare to be referred to an optometrist rather than to an ophthalmologist in a central hospital. This would save costs to society, reduce the workload of the central hospital eye clinics, enable services to be provided close to the patient and create an area of eye health that is missing from primary healthcare in Finland.

A significant proportion of the most common ICPC-2 coded eye-related visits in primary care is those where the optometrist can, even under current legislation, examine and comment on the health status of the patient's eyes. Many of the reasons recorded relate to visual symptoms and various symptoms of dry eye. The optometrist's skills and equipment allow him to carry out a higher quality examination than primary care and treat these symptoms without needing a medical exam and any necessary medication.

Removing non-medical legal provisions restricting the right of opticians and optometrists to prescribe spectacles would streamline the division of labour between eye health professions. Under current law, an optician/optometrist may not independently prescribe spectacles to a person who has or is suspected of having an eye disease, has undergone eye surgery, or is under eight years old. Lifting these restrictions would mean anyone needing glasses could obtain them on prescription from an optician/optometrist and would not have to see an ophthalmologist.

The lack of referral rights for opticians/optometrists is a significant factor in the workload of ophthalmologists in private practice. The Swedish and Norwegian models of optician/optometrist referral would facilitate patient access to care by eliminating the need to visit and pay for an ophthalmologist's examination to obtain a referral to a central hospital eye clinic for cataract surgery or for assessments and treatment for acute cases, for example.

Optometrists with a Master's Degree study the same pharmacology as nurses with a limited right to prescribe therapeutic medicines. The treatment of local eye infections, severe dry eye and eye-related allergic conditions would be facilitated and often accelerated if a Master's Degree optometrist could prescribe the medicines a patient needs.

The study did not address the potential of digitalization. Already today, and especially in the years to come, remote consultations and examinations are developing rapidly. This is a great opportunity, especially in a large region like Lapland, to establish services close to the patient without unnecessary time-consuming and expensive travel.

Thus, a new division of labour in eye healthcare is needed. The widespread use of optometrists' skills in public eye care would create significant cost savings and free up ophthalmologists' resources for more demanding eye disease treatments and eye surgery. This will require an open-minded, evidence-based assessment of the competencies of the different professional groups, leading to a redistribution of roles in eye care.

In summary, the study concludes that the level of optometry in Finland is very high compared to the European average, and Finnish optometrists have sufficient competence to act as primary professionals in vision and eye health. By exploiting the expertise and services provided by optometrists, the wellbeing services counties could resource eye care more efficiently in terms of cost and access to services. At the same time, the resources of ophthalmologists could be redirected to more demanding eye health care, such as eye surgery.

4.5 Reliability of the Research Development Work

The theoretical background for the thesis was collected to prove the level of optometry in Finland compared to the general European level, especially in neighbouring countries, Sweden and Norway. The study sought information from national grey literature sources to describe the state of Finnish healthcare and, more specifically, eye healthcare.

There have been no previous scientific studies on a similar topic, which slightly reduces the reliability of the data collected for the thesis. On the other hand, the data has been compiled mainly from the national grey literature sources, which provide factual information, such as legislative issues. Therefore, the reliability of the study's theoretical background can be considered sufficient.

The case study is only an isolated case and cannot be used to draw generalized conclusions, but it provides evidence that optometrists can act as primary eye health examiners.

4.6 Ethicality of the Research Development Work

This project was done for the Finnish Association of Vision and Eyecare (NÄE Ry). The partner was Brillat, where the examinations were carried out. The researcher collected all data on-site while the patient was seen in the clinic. The patient agreed to participate in this case study, and Brillat was responsible for the material that the survey required. A separate IRB approval was not needed.

4.7 Evaluation of the Research Development Work

The information generated by this case study and the background data will be used to support the development of optometrists as eye healthcare service providers in The Finnish Association of Vision and Eyecare (NÄE ry). At Brillat, the information generated by the study will be used to help develop optometrist services.

5 TIMETABLE AND BUDGET

The writing of the literature review started in the summer of 2022, and the last searches for the text were done on June 8, 2023. The case study examination for the patient was made on March 6, 2023.

There was no budget for the study; it was self-funded.

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7 APPENDICES

Curricula of the Bachelor's and Master's Degree Programmes in Finland, Norway and Sweden, APPENDIX 1

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CURRICULA OF THE BACHELOR'S AND MASTER'S DEGREE PROGRAMMES IN FINLAND, NORWAY AND SWEDEN, APPENDIX 1

Curricula of Bachelor's Degree of the Oulu University of Applied Sciences and Metropolia University of Applied Sciences (Oulu University of Applied Sciences, 2022. Metropolia University of Applied Sciences, 2023)

| Oulu University of Applied Sciences | Metropolia University of Applied Sciences |
|--|---|
| Study and Communication Skills | Introduction to Optometry |
| * Studying at the University of Applied Sciences | * Learning and Study Skills |
| * Professional Communication | * Spectacle Application and Manufacturing |
| * Professional English Communication | * General Anatomy and Physiology |
| | |
| * Professional Swedish Communication | * Dispensing in Optometric Practice |
| * Basics of Social Media | * Optics of the Spectacle Lenses |
| Natural Science in Optometry | Ocular Optics and Ametropias |
| * Mathematics and Physics for Optometrists | * Optics and Applications in Optometry |
| * Geometrical Optics | * Basics of the Eye Examination |
| | * Ocular Anatomy and Physiology, Clinical Microbiology and Investigate Techniques |
| * Physical Optics | * Refraction |
| * Visual Optics | |
| Research, Development and Management Studies in Optometry | Functions of the Visual System |
| * Epidemiology and Biostatistics | * Binocular Vision |
| * Work Community Skills | * Visual Perception |
| * Researching by Developing | * Visual Ergonomics and Swedish Language Skills |
| * Towards Innovations and Entrepreneurship | * Orthoptics and Work Placement |
| Technical Skills in Optometry: Competence in Spectacle Technology | Pathology, Pharmacology and Contact Lens Fitting |
| * Basics of Optometry and Dispensing Optics | * Contact Lens Fitting and Work Placement |
| * Spectacle Lens Technology | * Pathology and Pharmacology |
| * Dispensing Optics | * Methods for Research and Development |
| Clinical Skills in Optometry: Clinical Optometry | Ocular Health and Eye Diseases |
| * Objective Refraction | * Multidisciplinary Innovation Project |
| * Subjective Refraction | * Abnormal Ocular Condition and Refractive Surgery |
| * Contact Lens | * Planning of the Thesis Work |
| * Refractive Surgery | Special Topics in Optometry and Entrepreneurship |
| * Binocular Vision | * Pediatric Eye Diseases and Vision |
| * Visual Development and Pediatric Optometry | * Low Vision Patients and Elderly People |
| * Occupational Optics and Visual Rehabilitation | * Work Placement in Optometric Practice |
| | * Entrepreneurship in Management in the Social and Health Care Sector |
| Medical Skills in Optometry: | * Execution of the Thesis Work |
| * General Anatomy and Physiology | |
| * General Microbiology, Immunology, and Pathology | Optometrists as a Health Care Professional |

| | |
|--|--|
| * General Pathology and Diseases | * Optometrist as a Health Care Professional and the Work Placement |
| * General Pharmacology | * Reporting of the Thesis and Maternity Test |
| * Neurology | Elective studies |
| * First Aid | Bachelor's Thesis |
| * Visual Perception | |
| * Anatomy and Physiology of the Eye and Vision | |
| * Ocular Pharmacology | |
| * Abnormal Ocular Conditions | |
| Free Choice Studies | |
| Practical Training | |
| Bachelor's Thesis | |
| Total 210 ECTS | Total 210 ECTS |

Curriculum for Bachelor's Degree in Optometry in University of South-Eastern Norway (University of South-Eastern Norway 2023)

Mathematics and physics

Generic Anatomy, physiology and biochemistry

Optics and optotechnics

Basic optometry

Ocular Anatomy and Physiology

Examination methods

Optometry and society

Biostatics

Binocular Vision

Visual perception

Pharmacology and pathology

Clinical optometric practice

Basic ocular pathology

Basic contact lens fitting

Internal clinical practice

External clinical practice

Community optometry

Vision rehabilitation and visual Ergonomics

Optional international clinical practice

Bachelor's Thesis

Total 180 ECTS

Curricula of Bachelor's Degree Programme of Optometry in Karolinska Institutet and Linnéuniversitet (Karolinska Institutet 2023. Linnéuniversitet 2023)

| Karolinska Institutet | Linnéuniversitet |
|---|--|
| Optics | Optics |
| Basic Optometry | Optometry |
| Advanced Optometry | Workshop Technology for Opticians |
| Advanced Optometry and Perception | Perception |
| Clinical Optometry | General Physiology and Physiological Chemistry |
| Environmental Optometry | Ocular Anatomy and Physiology |
| General Anatomy and Physiology | Ocular Diseases |
| Ocular Anatomy, Physiology and Diseases | Pharmacology |
| Pathology | Contact Lens |
| Pharmacology | Low Vision Optometry |
| Micro-biology | Workplace Optometry |
| Contact Lens and Chemistry | Practical Training |
| Low Vision Optometry | Statistics and Science Methods |
| Statistics and Science Methods | Bachelor's Thesis |
| Bachelor's Thesis | |
| Total 180 ECTS | Total 180 ECTS |

The curriculum of the Master of Health Care, Clinical Optometry (Oulu University of Applied Sciences 2022)

| |
|---|
| Methods of Research and Knowledge Production |
| Clinical Biomedicine and General Clinical Procedures and Laboratory Tests |
| Advanced Ocular Science and Neurology and Clinical Ocular Procedures and Laboratory Tests |
| Ocular Pathophysiology and Clinical Ocular Procedures and Laboratory Tests |
| General and Ocular Pharmacology and Clinical Ocular Procedures and Laboratory Tests |
| Free-choice studies |
| Master's Thesis |
| Total 90 ECTS |

*Curriculum for Master in Optometry and Visual Science and Orthopaedics and Pediatric Optometry
(University of South-Eastern Norway 2023)*

| Optometry and Visual Science | Orthopaedics and Pediatric Optometry |
|--|--|
| Clinical Optometrical Practice for Authorized Optometrists | Clinical Optometrical Practice for Authorized Optometrists |
| Advanced Contact Lenses | Advanced Contact Lenses |
| Advanced Ocular Pathology | Advanced Ocular Pathology |
| Science and evidence-based practice | Science and evidence-based practice |
| Research methods and project description | Research methods and project description |
| Quantitative and qualitative methods | Quantitative and qualitative methods |
| Advanced clinical methods I - Posterior Segment | Orthoptics and Paediatric Optometry |
| Advanced clinical methods II - Anterior Segment | Orthoptics and Vision Therapy |
| Visual Ergonomics | Master Project |
| Master Project | |
| Total 120 ECTS | Total 120 ECTS |

*Curricula of Master's Degree Programme of Optometry in Karolinska Institutet and Linnéuniversitet
(Karolinska Institutet 2023. Linnéuniversitet 2023)*

| Karolinska Institutet | Linnéuniversitet |
|--|---|
| Ocular Pharmacology and Diagnostic Examination Methods | Ocular Pharmacology and Diagnostic Examination Methods |
| Neuro-Optometry | Neuro-Optometry |
| Ocular Diseases and Diagnostic | Ocular Diseases and Diagnostic |
| Binocular Vision and Treatment | Binocular Vision and Treatment |
| Pediatric Optometry | Pediatric Optometry |
| Diagnostic Clinic | Diagnostic Clinic |
| Master's Thesis | Research Methods in Optometry and Vision Science |
| Total 60 ECTS | Advanced Quantitative and Qualitative Research Methods in Optometry |
| | Special Contact Lenses and Fitting |
| | Anterior Eye and Drye Eyes |
| | Advanced Ophthalmic Photography Techniques and Disease Evaluation |
| | Degree Project in Biomedical Science with Specialization in Optometry |
| | Total 120 ECTS |

SCOPE OF THE OPTOMETRY PRACTICE IN EUROPE, APPENDIX 2

Scope of practice, countries from categories 1 and 2 (ECOO 2020)

| | FRANCE | TURKEY | BELGIUM | BULGARIA | CROATIA | CYPRUS | CZECH | GREECE | HUNGARY | ITALY | LUXEMBOURG | MACEDONIA | POLAND | ROMANIA | SERBIA |
|--|--------|-----------|------------|-----------|---------|------------|-------|--------------------|---------|-------|------------|-----------|--------|---------|--------|
| Objective refraction | Green | Red | Green | Green | Yellow | Yellow | Green | Green | Green | Green | Green | Yellow | Green | Green | Green |
| Subjective refraction | Green | Red | Green | Green | Yellow | Yellow | Green | Green | Green | Green | Green | Yellow | Green | Green | Green |
| Dispensing prescription spectacles | Green | Green | Green | Green | Yellow | Green | Green | Green | Green | Green | Green | Yellow | Green | Green | Green |
| Selling optical appliances | Green | Green | Green | Green | Yellow | Green | Green | Green | Green | Green | Green | Yellow | Green | Green | Green |
| Writing prescriptions for spectacles | Red | Red | Green | Green | Yellow | Yellow | Green | Green | Yellow | Green | Green | Yellow | Green | Green | Green |
| Fitting contact lenses | Yellow | Red | Green | Green | Yellow | Yellow | Green | Green | Green | Green | Green | Yellow | Green | Green | Green |
| Supply of contact lenses | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Yellow | Green | Green | Yellow |
| Writing prescriptions for contact lenses | Red | Red | Green | Green | Yellow | Yellow | Green | Green | Green | Green | Green | Yellow | Red | Green | Yellow |
| Examining the anterior eye | Yellow | Red | Green | Green | Yellow | Yellow | Green | Green | Green | Green | Green | Green | Grey | Green | Red |
| Examining the posterior eye | Red | Red | Red | Red | Yellow | Yellow | Red | Red | Red | Red | Red | Red | Grey | Green | Yellow |
| Ophthalmoscopy | Red | Red | Yellow | Yellow | Yellow | Yellow | Green | Red | Green | Green | Yellow | Green | Grey | Green | Yellow |
| Detecting ocular pathology | Red | Red | Yellow | Yellow | Yellow | Yellow | Red | Red | Green | Red | Red | Red | Grey | Yellow | Green |
| Using diagnostic drugs | Red | Red | Red | Red | Red | Red | Red | Red | Yellow | Red | Red | Red | Grey | Red | Red |
| Using therapeutic drugs | Red | Red | Red | Red | Red | Red | Red | Red | Yellow | Red | Red | Red | Grey | Red | Red |
| Referring to an ophthalmologists | Green | Yellow | Green | Green | Yellow | Yellow | Green | Green | Yellow | Green | Green | Yellow | Grey | Green | Yellow |
| Referring directly to eye hospital | Green | Yellow | Green | Green | Red | Yellow | Green | Red | Red | Red | Red | Red | Grey | Red | Red |
| Informing medical doctors of patients pathology | Red | Yellow | Green | Green | Yellow | Yellow | Red | Red | Green | Red | Red | Green | Grey | Yellow | Yellow |
| Non-contact tonometry | Red | Red | Green | Green | Yellow | Yellow | Green | Green | Green | Green | Yellow | Yellow | Red | Green | Yellow |
| Contact tonometry | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red |
| Checking binocular vision | Green | Red | Green | Green | Yellow | Yellow | Green | Green | Yellow | Green | Green | Yellow | Green | Green | Yellow |
| Orthoptics | Red | Red | Red | Red | Red | Red | Red | Red | Yellow | Green | Red | Red | Red | Green | Red |
| Perimetry | Red | Red | Red | Red | Red | Red | Green | Green | Yellow | Green | Red | Red | Red | Green | Red |
| Myopia management | Green | Red | Yellow | Yellow | Yellow | Yellow | Green | Green | Yellow | Red | Green | Red | Yellow | Green | Yellow |
| Testing drivers sight | Red | Red | Yellow | Red | Red | Red | Red | Red | Red | Red | Red | Red | Yellow | Red | Red |
| Testing VDU (Visual Display Units) users | Green | Yellow | Green | Green | Yellow | Yellow | Green | Green | Green | Green | Yellow | Yellow | Yellow | Yellow | Red |
| Fitting optical appliances for VDU users | Green | Yellow | Green | Green | Yellow | Yellow | Green | Green | Green | Green | Yellow | Yellow | Green | Green | Red |
| Testing sight of low vision patients | Green | Red | Green | Yellow | Yellow | Yellow | Green | Green | Green | Green | Green | Green | Green | Green | Yellow |
| Prescribing low vision aids for the partially sighted | Green | Red | Red | Green | Yellow | Yellow | Green | Green | Green | Red | Red | Yellow | Green | Green | Yellow |
| Testing the vision of and prescribing spectacles to children under the age of 6 years | Red | Red | Red | Red | Yellow | Yellow | Red | Red | Red | Red | Green | Red | Red | Green | Yellow |
| Testing the vision of and prescribing spectacles to children under the age of 12 years | Red | Red | Red | Red | Yellow | Yellow | Red | Red | Yellow | Green | Green | Red | Red | Green | Yellow |
| Fitting and supplying spectacles to children (0-18 years) | Green | Green | Green | Green | Yellow | Yellow | Green | Green | Green | Green | Green | Green | Green | Green | Yellow |
| | CAT 1 | | CATEGORY 2 | | | | | | | | | | | | |
| | Green | Permitted | Yellow | Practised | Red | Prohibited | Grey | No answer provided | | | | | | | |

Scope of practice, countries from categories 3 and 4 (ECOO 2020)

| | AUSTRIA | DENMARK | ESTONIA | GERMANY | LATVIA | LITHUANIA | SPAIN | FINLAND | IRELAND | NETHERLANDS | MALTA | NORWAY | SWEDEN | SWITZERLAND | THE UK |
|--|--------------------------|-----------|------------|--------------------|--------|-----------|--------|-----------------------|---------|-------------|--------|--------|--------|-------------|--------|
| Objective refraction | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Subjective refraction | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Dispensing prescription spectacles | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Selling optical appliances | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Writing prescriptions for spectacles | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Fitting contact lenses | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Supply of contact lenses | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Writing prescriptions for contact lenses | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Examining the anterior eye | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Examining the posterior eye | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Ophthalmoscopy | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Detecting ocular pathology | Green | Green | Green | Green | Green | Yellow | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Using diagnostic drugs | Yellow | Red | Red | Red | Red | Yellow | Red | Grey | Green | Green | Yellow | Green | Green | Green | Green |
| Using therapeutic drugs | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red |
| Referring to an ophthalmologists | Green | Green | Green | Green | Green | Green | Green | Yellow | Green | Green | Green | Green | Green | Green | Green |
| Referring directly to eye hospital | Green | Yellow | Green | Green | Green | Green | Green | Yellow | Red | Green | Green | Green | Green | Green | Green |
| Informing medical doctors of patients pathology | Green | Green | Green | Green | Green | Green | Green | Yellow | Green | Green | Green | Green | Green | Green | Green |
| Non-contact tonometry | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Contact tonometry | Yellow | Yellow | Red | Yellow | Yellow | Yellow | Red | Grey | Green | Green | Green | Green | Green | Yellow | Green |
| Checking binocular vision | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Orthoptics | Green | Yellow | Green | Green | Green | Green | Yellow | Green | Green | Green | Green | Red | Green | Green | Green |
| Perimetry | Green | Green | Yellow | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| Myopia management | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Yellow |
| Testing drivers sight | Green | Green | Green | Green | Green | Green | Red | Grey | Green | Green | Green | Yellow | Green | Green | Green |
| Testing VDU (Visual Display Units) users | Green | Green | Green | Green | Green | Green | Yellow | Green | Green | Green | Green | Green | Green | Green | Yellow |
| Fitting optical appliances for VDU users | Green | Green | Green | Green | Green | Green | Yellow | Green | Green | Green | Green | Green | Green | Green | Yellow |
| Testing sight of low vision patients | Green | Green | Green | Green | Green | Green | Yellow | Green | Green | Green | Green | Green | Green | Green | Green |
| Prescribing low vision aids for the partially sighted | Green | Green | Green | Green | Green | Green | Yellow | Green | Green | Green | Green | Green | Green | Green | Green |
| Testing the vision of and prescribing spectacles to children under the age of 6 years | Green | Yellow | Red | Green | Green | Green | Red | Green | Red | Green | Green | Red | Green | Red | Green |
| Testing the vision of and prescribing spectacles to children under the age of 12 years | Green | Green | Yellow | Green | Green | Green | Red | Green | Green | Green | Green | Green | Green | Green | Green |
| Fitting and supplying spectacles to children (0-18 years) | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | without diagnostic drugs | | | | | | | with diagnostic drugs | | | | | | | |
| | CATEGORY 3 | | | | | | | | | | | | | | CAT 4 |
| | Green | Yellow | Red | Grey | Green | Yellow | Red | Grey | Green | Yellow | Red | Grey | Green | Yellow | Red |
| | Permitted | Practised | Prohibited | No answer provided | | | | | | | | | | | |

**NUMBER OF EYE HEALTHCARE PROFESSIONALS IN EUROPE IN CATEGORIES 3 AND 4,
APPENDIX 3**

| | Optometrists | Ophthalmologists | Retail outlets/practices |
|-------------|--------------|------------------|--------------------------|
| Denmark | 5,29 | 0,50 | 1,11 |
| Finland | 2,87 | 0,89 | 1,22 |
| Norway | 2,82 | 1,04 | 1,15 |
| Sweden | 2,55 | 0,79 | 0,91 |
| The UK | 2,37 | 0,22 | 1,20 |
| Ireland | 1,76 | 0,69 | |
| Switzerland | 1,47 | 1,38 | 1,23 |
| Netherlands | 0,73 | 0,38 | 1,29 |
| Malta | 0,33 | | 1,24 |

Per 10 000 population

CASE STUDY EXAMINATION, APPENDIX 4

Case History

Patient demographics: 73 years old caucasian female

Chief complaint: Reduced vision in left eye

Ocular and medical history: No eye diseases, no medications for eye

Medications: No medications

Family history: There are no eye diseases in the family

Clinical Findings

Entrance exam: Visual acuity 0.9/0.05

Pupillary testing: Not tested

Extraocular muscle testing: Not tested

Confrontation field testing: OD normal. With the left eye, she could only detect the optometrist's left ear leaf when facing the patient from the optometrist's face. Otherwise, the whole face was covered by a dark shadow.

Refraction: Refraction was not made

Slit lamp examination

Description of all structures of the anterior segment:

- Lids: Normal in both eyes
- Bulbar conjunctiva: Normal in both eyes
- Cornea: Clear in both eyes
- Chamber angles: Four in both eyes using the Van Herick method
- Anterior chamber: No inflammatory cells in either eyes
- Iris: Normal in both eyes
- Lens: Incipient cataract in both eyes

Tonometry: 15/17

Method: iCare tonometer

Diagnostic drugs: Tropicamide 5mg, one drop to both eyes

Posterior Segment

- Vitreous: Normal in both eyes
- Papilla: Physiological in both eyes
- Macula: OD: normal. OS: Swollen, haemorrhage covering the macular area and lower branches of main vessels. The haemorrhage site was about three times the height of the papilla and twice as wide.
- Vessels of the retina: Physiological in both eyes, except OS Lower branches were not visible
- Retina: Normal in both eyes, except OS macular area

Physical studies

- Fundus image: OD: normal. OS: haemorrhage covering the macular area and lower branches of main vessels. The haemorrhage site was about three times the height of the papilla and twice as wide.
- OCT- scan for papillar area: OD: physiological. OS: physiological.
- OCT- scan for macular area: OD: slight unevenness between the retinal pigment layer and Bruch's membrane in the macular area. OS: swollen. Fluid under the retina

Diagnosis and treatment

Differential Diagnosis: Subretinal haemorrhage

Primary/leading Diagnosis: Sudden wet macular degeneration

Treatment, Management: Ophthalmologist consultation. The patient was told to monitor the condition of the right eye actively and regularly. The optometrist taught the patient how to use the Amsler grid and instructed her to use it daily to check the central vision of the right eye. At the time of the examination, no distortions were visible on the grid when looking with the right eye. The patient was also instructed to monitor the condition of the left eye, paying attention to any changes.

Treatment and response to treatment: A referral for having anti-VEGF- injections with a degree of urgency 1-7 days.

Referral: Refer to the Eye Clinic of the Lapland Central Hospital

Discussion

Due to the sudden deterioration of vision, the optometrist considered the examination urgent.

Based on the examination, the optometrist concluded that an urgent consultation with an ophthalmologist was necessary.

Based on the consultation, the ophthalmologist diagnosed wet age-related macular degeneration and determined the treatment to be the initiation of anti-VEGF -injections with an urgency of 1-7 days. On examination and consultation, it was assumed that improving vision was no longer possible, but that treatment could halt this progression.

In such cases, there is a risk of the same occurring in the other eye, so the patient was advised to monitor the vision in the right eye using the Amsler chart.