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Components of eye health checks provided by optician retail stores in Denmark

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ABSTRACT

INTRODUCTION. This study aimed to report the components of optometrist-facilitated eye health checks in optician chain stores in Denmark.

METHODS. In this survey-based cross-sectional study, we screened the 600 optician stores listed on the website of Fight for Sight Denmark and included optician store chains with more than 50 stores nationwide. The websites of each chain were reviewed to identify current trends in eye health checks, from which an interview guide was developed. Survey data were collected by conducting in-person interviews in three different optician stores from each chain.

RESULTS. Five optician store chains were eligible for inclusion in this study. All but one chain included at least non-contact air-puff tonometry and non-mydriatic colour fundus photography in their eye health check. In two of the chains, telemedical evaluation was mandatory for all abnormal results found by the in-store optometrists, whereas telemedical services were optional in the remaining optician chains.

CONCLUSIONS. This study reported the contents and organisation of optometrist-facilitated eye health checks across the five largest optician store chains in Denmark. We found that the content of eye health checks differs between chains and that their results are evaluated differently. Standardisation of the area and development of guidelines may be necessary if optometrists are to play a role in eye health screening.

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Optometrist-facilitated eye health checks were introduced in 2015 including intraocular pressure measurement and fundus photography [1]. Subsequently, various similar screening initiatives have appeared in different optician stores. Throughout this article, “screening” refers to examining asymptomatic individuals to discover potential, preventable diseases. Eye health checks provided by optician chain stores are not officially regarded as population screening; only the Danish Health Authority can formally implement population screening. Optometrist-facilitated eye health checks have yielded criticism from primary care ophthalmologists who suspect that they are performed in excessive numbers by providers lacking sufficient education to evaluate the findings appropriately. Primary care ophthalmologists have experienced a surge in false-positive referrals and prolonged patient wait times for appointments within the publicly funded primary care in ophthalmology, and believe this to be a consequence of the eye health checks performed by optometrists, not currently authorised to diagnoses [2]. Still, Denmark has an ageing population with an estimated increase in the number of patients with

eye diseases [3-8], for which optometrist-facilitated eye health checks have been suggested as a potential solution to alleviate the growing strain on public healthcare [9]. The debate on optometrist-facilitated eye health checks is ongoing; however, to date, there is limited systematic data collection on what these eye health checks contain, how the obtained findings are evaluated and how the screening system is organised. This study provides an overview of the current landscape of eye health checks provided by optometrists at large optician store chains in Denmark.

Methods

This was a descriptive survey-based cross-sectional study on current trends in optometrist-facilitated eye health checks in Denmark. On 16 February 2024, we screened the 600 optician stores listed on the official website of Fight for Sight Denmark [10], including optician store chains with more than 50 stores nationwide. Websites from the included chains were reviewed to phrase relevant questions regarding eye health checks. In this study, an eye health check is defined as the addition of either measurement of intraocular pressure, posterior segment fundus imaging, optical coherence tomography (OCT), visual field analysis or slit lamp examination to the primary vision examination consisting of refraction/anterior segment investigations. By reviewing their websites, we developed an interview guide including the following topics: modalities included in the health check, their prices, evaluation of the test results, the referral process to public healthcare, optometrist follow-up after referral, optometrist follow-up on individuals with known eye disease, and if the information available on their website was consistent with the information obtained through the interview. Data were collected through in-person interviews with optometrists in three different convenience-sampled optician stores from each chain near the living area of the interviewer in the Copenhagen area. No appointment was scheduled beforehand for the interviews. This strategy ensured that the study results reflected actual practices to which customers are exposed rather than prepared statements from the chains involved.

Trial registration: not relevant.

Results

Five optician store chains met the inclusion criteria. The five chains will not be mentioned by their brand name but are referred to as A, B, C, D and E below. We estimate that the total number of optician stores in Denmark is 646 based on the frequency of optician stores in 2020 (1.11 per 10,000) [11] and the Danish population in the same year (5,822,763) [12]. The five optician store chains account for 447 of these. Generally, three types of consultations were provided by the optometrists across the five chains: 1) a free autorefractor-based estimate of visual acuity; 2) an extended examination that also included an optometrist-facilitated refraction and anterior segment investigation, as well as; 3) an eye health check, including further modalities. C was the only chain offering an extended examination and an eye health check as separate items. Extended examinations included an eye health check per default in chains A, B and D. All three interviewed stores in chain E offered only one type of consultation in which the individual optometrist assessed the need for different screening modalities. **Table 1** contains detailed data on the services that the five chains provided, the modalities included in their tests and retail prices.

TABLE 1 The five largest optician store chains screened, the number of active stores in Denmark, the modalities that the stores provide to their customers and the price of eye health checks.

Optician store chain	Stores in Denmark, n	Free-of-charge autorefractor-based BCVA	Extended eye health check		
			modalities	standard price	other prices related to
A	112	√	NCT NMFP	298 DKK	If spectacles are purchased within 30 days: 0 DKK When subscribed to a monthly payment[a] "Lifestyle": 0 DKK
B	103	√	NCT NMFP VFA	348 DKK	When subscribed to a monthly payment[b] "All-inclusive": 0 DKK
C	85	√	NCT NMFP OCT	795 DKK for refraction and slit lamp examination + 350 DKK for the extended eye health check	If spectacles are purchased: 0 DKK For the extended eye health check if the optometrist found it necessary during their refraction and slit lamp examination: 0 DKK
D	80		NCT NMFP VFA at the discretion of the optometrist OCT at the discretion of the optometrist or at additional cost	245 DKK + 100 DKK for OCT	The OCT can be made free of charge at the discretion of the optometrist
E[c]					
1	67		NMFP VFA Slit lamp examination at the discretion of the optometrist	0 DKK	Customers may be charged a fee for a print of the results
2	67		NCT VFA OCT Slit lamp examination if the customer is > 50 yrs old, there is a relevant family history, or the customer requests it specifically	0 DKK	Customers may be charged a fee for a print of the results
3	67		Slit lamp examination at the discretion of the optometrist	0 DKK	Customers may be charged a fee for a print of the results: 450 DKK

BCVA = best-corrected visual acuity; NCT = non-contact air-puff tonometry; NMFP = non-mydriatic colour fundus photography; OCT = optical coherence tomography; VFA = visual field analysis.
a) ≥ 78 DKK/mo.
b) ≥ 80 DKK/mo.
c) Voluntary optician store chain consisting of independent store owners. Hence, responses from each of the three stores are listed separately.

In chains A and D, all results deemed abnormal by the on-site optometrist underwent telemedical evaluation before any referral. Chain A used a clinical decision support system that included an initial artificial intelligence-based assessment followed by a telemedical evaluation performed by ophthalmologists or specialised optometrists. In D, the telemedical evaluation was performed by a private tele-ophthalmological company consisting of 12 specialised consultant ophthalmologists. In chains B and C, the results were sent to other specialised optometrists or ophthalmologists if the on-site optometrists themselves assessed that a second opinion was needed. Each of the individual stores in E had different procedures, which are listed in **Table 2**.

TABLE 2 The five largest optician store chains in Denmark and their organization for evaluation, referral, and follow-up after an eye health check.

Optician store chain	1st assessment	2nd assessment		Procedure following acute, sight-threatening findings	Response time to the customer after non-acute abnormal results, hours	Procedure of referral	Follow-up	
		description	requirements				in-store after referral	on known ophthalmological diagnoses
A	On-site optometrist and AI-based clinical decision support system	Ophthalmologists and specialised optometrists	All abnormal results undergo 2nd assessment Timing of the 2nd assessment depends on the perceived urgency from the 1st assessment	On-site optometrist contacts the Danish emergency number	1-48	A printed referral is handed out in the store, including remarks from clinical support	Is advised	Customers are asked about known diseases and if they follow advised treatment Known eye diseases are examined at the individual optometrist's discretion
B	On-site optometrist	Ophthalmologists and specialised optometrists	None	On-site optometrist contacts the Danish emergency number	0-48	A printed referral is handed out in the store, including remarks from clinical support	Upon customer request	Customers are asked about known diseases and if they follow advised treatment Known eye diseases are examined at the individual optometrist's discretion
C	On-site optometrist	Ophthalmologists and specialised optometrists	None	On-site optometrist contacts the Danish emergency number	0-48	A printed referral is handed out in the store, including remarks from clinical support	Upon customer request	Customers are asked about known diseases and if they follow advised treatment Known eye diseases are generally not examined
D	On-site optometrist	Private tele-ophthalmological company	All abnormal results undergo 2nd assessment Timing of the 2nd assessment depends on the perceived urgency from the 1st assessment	The on-site optometrist calls the consultant ophthalmologist for an immediate second opinion, from where the ophthalmologists evaluate the findings and react accordingly	0.5-48	Consultant ophthalmologists submit digital referrals through the national electronic referral system	Only if deemed necessary by the ophthalmologist	Customers are asked about known diseases and if they follow advised treatment Known eye diseases are generally not examined unless requested otherwise by the ophthalmologist
E[a]								
1	On-site optometrist	Local retired ophthalmologist	None	The on-site optometrist or the customer contacts the Danish emergency number	Immediately	No referral is printed, and the patient is advised to see an ophthalmologist	Upon customer request	Customers are asked about known diseases and if they follow advised treatment Known eye diseases are generally not examined
2	On-site optometrist	Ophthalmologists	None	The on-site optometrist or the patient contacts the Danish emergency number	0-24	A printed referral is handed out in the store	Upon customer request	Customers are asked about known diseases and if they follow advised treatment Known eye diseases are generally not examined
3	On-site optometrist	No second opinion	Not available	The customer is advised to call their general practicing doctor, who will decide on any hospital referral	Immediately	A printed referral is handed out in the store	Upon customer request	Customers are asked about known diseases and if they follow advised treatment Known eye diseases are generally not examined

AI = artificial intelligence.
a) Voluntary chain consisting of independent store owners; hence, responses from each of the three stores are listed separately.

In D, the referrals to the primary or tertiary health sector were made by ophthalmologists using the national digital referral system for doctors in Denmark. In the four other chains, the optometrist created a referral, including the description from a telemedical evaluation. The referral was then printed and given to the customer in the store. D was the only chain with specific guidelines on customer follow-up. They only conducted these if one of their consultant ophthalmologists advised them to do so. Other chains followed up after referrals on

patient requests. All optician store chains conducted preliminary interviews regarding any known disease and whether the customers were followed routinely by an ophthalmologist for these diseases. However, the opinion about examining for the known disease varied with the individual optometrist. Table 2 contains detailed data on the process following an eye health check in each of the five chains.

Discussion

This is the first study to report the circumstances around optometrist-facilitated eye health checks in Denmark. We found that the five largest optician chains, covering more than two-thirds of optician stores in Denmark, offer an eye health check either as an additional service or as part of the routine eye examination needed to buy spectacles/contact lenses. Eye health checks included non-mydriatic colour fundus photography and non-contact air-puff tonometry in all chains, except E, in which health checks varied between stores. Visual field analysis was occasionally performed in chains B and D if the optometrists found this necessary. OCT was available in chains C and D. The answers obtained from the in-person interviews were generally consistent with the information provided online, except for E, which advertised eye health checks online. Still, when asked about these eye health checks during the interviews, some optometrists from chain E denied offering these health checks and viewed the term “health check” as a marketing ploy to attract customers. Critics have also speculated that the motive behind providing eye health checks in optician retail stores is to gain customers and increase sales, highlighting a potential problem of optometrist-based health screening in a country with publicly funded healthcare. Most of the interviewed optometrists considered themselves healthcare professionals and any conflict between interest in sales and healthcare was considered minor.

In each of the five optician store chains, the results from the eye health checks were initially assessed by the on-site optometrist (assisted by a medical artificial intelligence service in chain A) to identify either normal, abnormal non-acute, or acute sight-threatening findings requiring immediate action. A normal test result triggered no further action in the five chains. The process following abnormal non-acute findings differed between the optician store chains. Chains A and D required all abnormal results to undergo telemedical evaluation before making any patient recommendations. In contrast, optometrists in B, C and E had the option of telemedical assistance, but this was not required before referring patients. This explains why some optician chain stores could provide response times as low as zero hours; their results had not necessarily undergone secondary assessment. These differences highlight the variety within the landscape of optometrist-facilitated health checks in Denmark, which differs substantially from the standardised, guideline-based, legislative-heavy healthcare system. This raises concerns regarding their role in publicly funded healthcare.

Optometrists in Denmark are authorised to distinguish between normal and pathological findings in both the anterior and posterior eye segments and may refer customers as needed. Their bachelor’s degree includes ocular pathology and pharmacology, but they cannot use diagnostic or therapeutic drugs. Consequently, optometrists perform fundus photography and OCT without pupillary dilation, which impairs the quality of the results from these modalities. The content of an optometrist's eye examination is not legally regulated, leading to unclear responsibilities and imbalance between the primary and tertiary health sectors [11]. This poses challenges that are problematic in a public healthcare system relying heavily on regulated pacing. The optometrist-facilitated eye health checks have concerned ophthalmologists who experience a surge in patients seen by optometrists, contributing to long waiting lists for an appointment with an ophthalmologist [13].

Another significant contribution to the long waiting lists is the ageing demographics, which severely increases the need for eye care. This development is not currently being met by a corresponding rise in the number of ophthalmologists in primary healthcare [14]. The number of citizens above 80 years of age has increased from 228,505 in 2011 to 282,106 in 2021, corresponding to a 23.5% increase [12]. Meanwhile, the number of primary

care ophthalmologists increased from 190 to 202, corresponding to only a 6.3% increase [15]. With 5.29 optometrists and only 0.5 ophthalmologists per 10,000 citizens in Denmark, optometrists' capacity may be a valuable resource to Danish healthcare if organised appropriately. Particularly in the rural parts of Denmark, where primary care ophthalmologists are less accessible than in the larger cities, optometrists may potentially serve as their extended arm. However, this presupposes that the role of optometrists is clearly defined, that they are equally and adequately educated to undertake this role and that telemedical communication between optometrists and ophthalmologists operates properly.

One of the primary concerns regarding health checks is the amount of false positive referrals. This was assessed in a study of telemedical services in Louis Nielsen [16]. The study reported that among all health checks conducted by optometrists, 3% were sent for telemedical evaluation by ophthalmologists, of which 14.5% were false positives. The study also showed that the telemedical ophthalmologists referred 19.5% of the test results received from optometrists to national healthcare, thus filtering 80.5% of test results that were either normal or could be sufficiently monitored at the optician store. This reveals a possible solution to excessive referrals to the publicly funded healthcare system. Guidelines and legislation could ensure a heightened quality of referrals to the public healthcare system and a clearer distribution of responsibilities.

Our study has various limitations. Firstly, we only included stores from the five largest optician store chains in Denmark, meaning that smaller chains and single stores were not investigated. Secondly, interviews were conducted solely in the Copenhagen area, but we anticipate similar responses in other regions, except for chain E, where responses varied between stores. Thirdly, our data relied on answers provided by the available optometrist at the time of the visit, and the reliability of their statements has not been investigated, e.g., by booking appointments for a health check as a customer without informing the optometrist that the check was performed for research purposes. In an interview setting, one might speculate that the in-store optometrist is potentially more likely to give answers that favour their brand.

Conclusions

Optometrist-facilitated eye health checks were introduced a decade ago. Whether screenings of the population beyond the healthcare system are generally a desirable practice is beyond the scope of our study. As optometrist-facilitated health checks increase in availability and keep causing debate, our study provides an important overview of what an eye health check implies. Our study reported that eye health checks are available in the five largest optician store chains. However, consistent standards on how the results of a health check are processed between optician store chains are currently lacking. Standardisation of the area, development of guidelines, and updated education of optometrists may be necessary measures if optometrists are to play an advanced role in public healthcare.

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