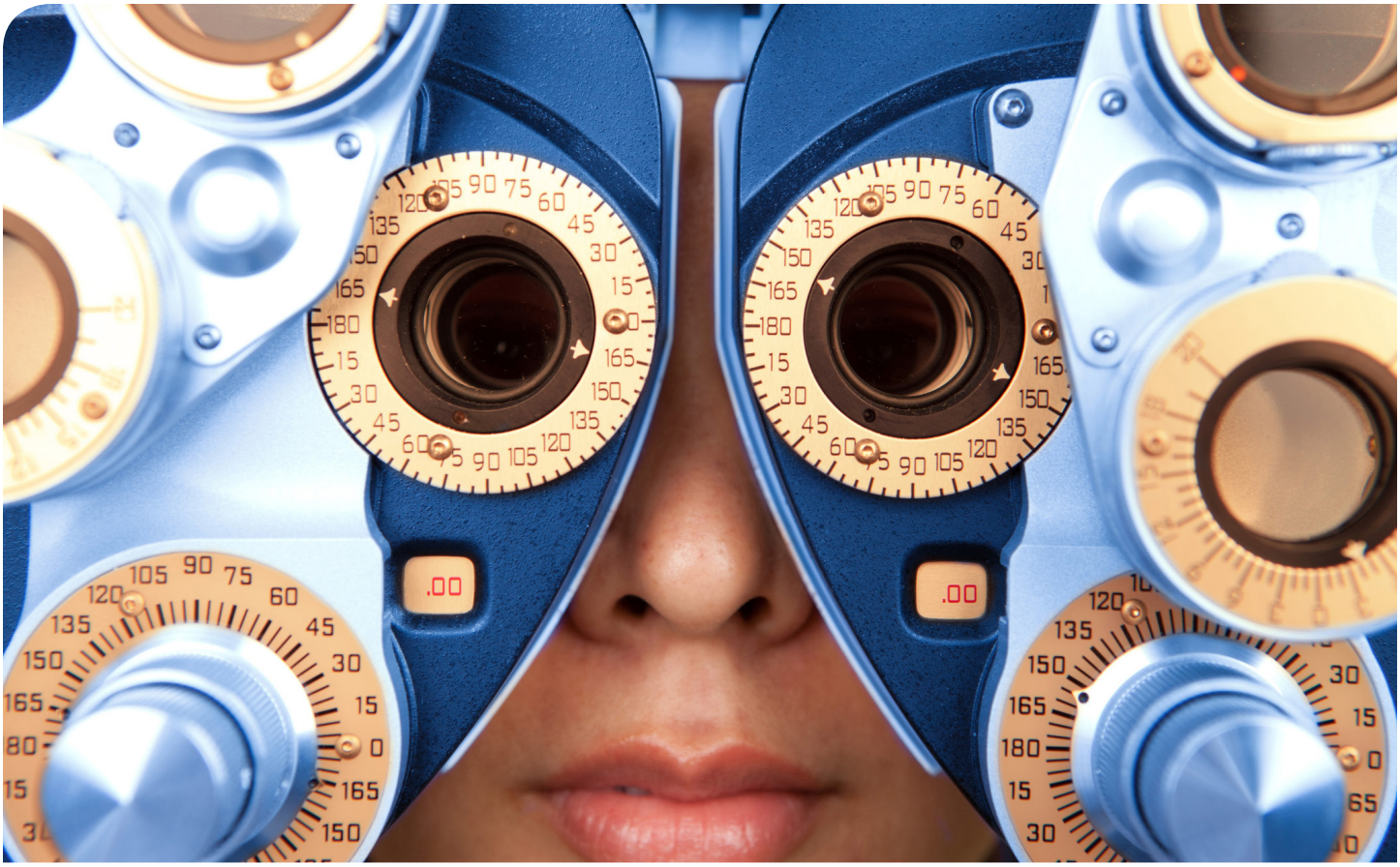
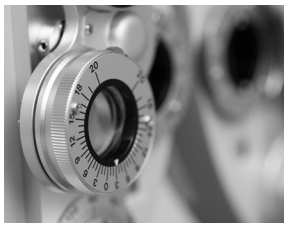












Meeting the Eye Health and Vision Care Needs of Canadians: A Workforce Analysis

A report from the **CANADIAN ASSOCIATION OF OPTOMETRISTS**

Prepared by Lisa Little Consulting, April, 2018

CANADIAN ASSOCIATION OF OPTOMETRISTS
ASSOCIATION CANADIENNE DES OPTOMÉTRISTES

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Executive Summary

The future of eye health and vision care[i] in Canada is of concern. Vision loss[ii] is the most feared disability for Canadians (69%).[1] The prevalence of vision loss in Canada is expected to increase nearly 30% in the next decade.[2] Vision loss has the highest direct health care costs of any disease.[3] The financial burden of vision loss is expected to double, reaching $30.3 billion by 2032.[3]

The time to act is now, given that over 75% of vision loss is preventable or treatable.[4]

Canada must plan for how it will provide optimal eye health and vision care for its citizens. This report, by the Canadian Association of Optometrists (CAO), examines the eye health and vision care services medical workforce and is presented as a starting point. It analyzes the current and future eye health and vision care needs of Canadians and the capacity of four key provider groups—optometrists (ODs), ophthalmologists, general practitioners/family physicians (GP/FPs), and nurse practitioners (NPs)—to respond to those needs.

This report is based on a modified version of the full population health needs-based planning analytical model,[5] using available public, grey and peer review literature, statistics and data. A population health needs-based approach to health human resources (HHR) planning has been endorsed by federal, provincial and territorial governments.[6]

The use of eye health and vision care services by seniors (who are the fastest growing age segment of the population), and many others, is suboptimal. A significant proportion of Canadians who are at a high risk of vision loss do not access eye care services, including 14% of glaucoma patients, 37% of people with diabetes, and 41% of people aged 65 years or older. Vulnerable populations such as children, Indigenous persons, and those living in rural and remote areas also need eye health and vision care services. Recent research further suggests the eyesight of the general population is deteriorating and at a much younger age.[7]

In Canada, the number of ODs is five times that of ophthalmologists, and they have a younger profile and are widely accessible. In addition, the OD workforce is growing at three times the rate of the ophthalmologist workforce. All this suggests the role of ODs in primary care could be expanded. They are competent to provide primary eye care including screening, diagnosis and management of the four most common eye diseases affecting Canadians. When the complexity of the patient's condition increases, they consult with or refer to an ophthalmologist. This collaborative model of care management is person-centred and cost effective and should be optimized.

There are overlapping scopes of practice among key eye care professions. It is imperative to optimize the contributions of the eye health and vision care workforce by using each provider most effectively. This requires using skills and knowledge appropriately and aligning eye health and vision care needs with the optimal configuration of skills and providers, recognizing the environments in which they work. A collaborative model of eye care management for primary, secondary and tertiary care by the most appropriate provider is essential, as are appropriate, effective and timely referrals and consultation among all providers on the eye health and vision care continuum.

This report examines the changes needed to effectively manage the growing need for eye health and vision care services. One significant way to reduce the future need and the costs to the health system is to increase access to primary eye and vision care and ensure patients see the right provider at the right time.

The CAO calls for the following strategies to meet the growing eye health and vision care needs of Canadians. ›

[i] In this report, the terms "eye health and vision care" and "vision health" reflect medical/surgical and vision eye care beyond care provided by opticians who fit and dispense eyeglasses, contact lenses, low vision aids, and prosthetic ocular devices for clients.

[ii] The term "vision loss" is defined by CNIB as an inclusive term that covers all people who are blind or partially sighted, including people who have no sight from birth, people who are legally blind (meaning they have a best-corrected visual acuity of 20/200 or worse and/or a visual field of less than 20 degrees in the better eye), as well as people with vision loss below these levels. In addition to low visual acuity and narrowed visual field, vision loss can also be characterized by other forms of impairment such as loss of depth perception or contrast sensitivity.

THE CAO CALLS FOR THE FOLLOWING STRATEGIES TO MEET THE GROWING EYE HEALTH AND VISION CARE NEEDS OF CANADIANS.

1 Enhance the use of ODs for primary eye care by:

- optimizing the scope of practice of ODs across Canada to align with their education and training and national competencies
- addressing barriers to access to eye health services, particularly for children and marginalized populations

2 Use ophthalmologists as much as possible for their unique expertise and competencies in secondary and tertiary care.

3 Assess ophthalmology postgraduate capacity to ensure the future supply of ophthalmologists is adequate to meet the specialized eye care needs of Canadians.

4 Align and enhance competencies, scope of practice and education of each of the eye health and vision care provider groups with emerging technologies, pharmaceuticals and procedures.

5 Enhance interdisciplinary eye health and vision care services and appropriate use of providers by:

- developing joint national referral and consultation guidelines
- educating each provider about other eye health and vision care providers' competencies and scopes of practice
- implementing best practice and/or innovative collaborative models of care

6 Optimize the use of emerging technologies to improve:

- access to safe, appropriate eye health and vision care services
- interprofessional collaboration
- accuracy and timeliness of diagnosis and treatment
- access to eye health and vision care services in rural and remote areas

7 Promote timely access to services, especially in remote and underserved areas, by:

- implementing geographical incentives for eye health and vision care providers
- exploring innovative models of care that optimize the scope of practice of existing providers
- including rural and remote clinical placements in educational curricula

8 Launch a vision health public awareness campaign targeting the general public, as well as underserved and at-risk populations including Indigenous people, children and seniors.

9 Enhance data collection to provide pan-Canadian workforce data and address other data limitations identified in this report to support eye health and vision care HHR planning.

Introduction

Background

The future of Canada's eye health and vision care is of concern. Vision loss is the most feared disability for Canadians (69%).[1] The prevalence of vision loss in Canada is expected to increase nearly 30% in the next decade.[2] Vision loss has the highest direct health care costs of any other disease.[3] The financial burden of vision loss in Canada in 2007 was estimated at $15.8 billion. By 2032, vision loss is expected to cost Canadians $30.3 billion.[3] Fortunately, over 75% of vision loss is preventable or treatable.[4] Canada must plan for how it will provide optimal eye health and vision care for its citizens. This report, issued by the Canadian Association of Optometrists (CAO), examines the eye health and vision care services medical workforce and is presented as a starting point.

Eye health and vision care services in Canada are predominantly provided by four key provider groups: optometrists (ODs), ophthalmologists, general practitioners/family physicians (GP/FPs), and nurse practitioners (NPs). A small number of registered nurses with additional training also provide eye health and vision care services in select provinces. Patients with urgent eye conditions, emergencies or trauma may present to emergency departments and initially see emergency physicians, but are then commonly referred to optometrists or ophthalmologists. For this reason, emergency physicians are not included in this analysis.

Levels of education, training and competencies vary among the four groups. Ophthalmologists are the most extensively trained; however, many restrict their practice, specializing in cornea and external disease, glaucoma, neuro-ophthalmology, ophthalmic pathology, ophthalmic plastic surgery, pediatric ophthalmology, retina, uveitis and low vision.[8] The other three professions provide eye health and vision care services at the primary and secondary levels, with optometrists' scope of practice being the broadest, including routine examinations, refraction, spectacle and contact lens therapy, oculomotor and perceptual dysfunctions, assessment, therapy and rehabilitation, low vision assessment and rehabilitation, disease management, and surgical co-management with ophthalmologists. Most GP/FPs and NPs providing eye care deal with urgent and emergent conditions, with a small number involved in refractive care.

Opticians, while providing some vision correction services, do not provide eye health and vision care. Ophthalmic and optometric assistants may provide eye health and vision care, but only under the supervision of ophthalmologists and optometrists. Since they do not provide eye health and vision care independently, these three provider groups are not included in this report.

Purpose

The purpose of this report is to:

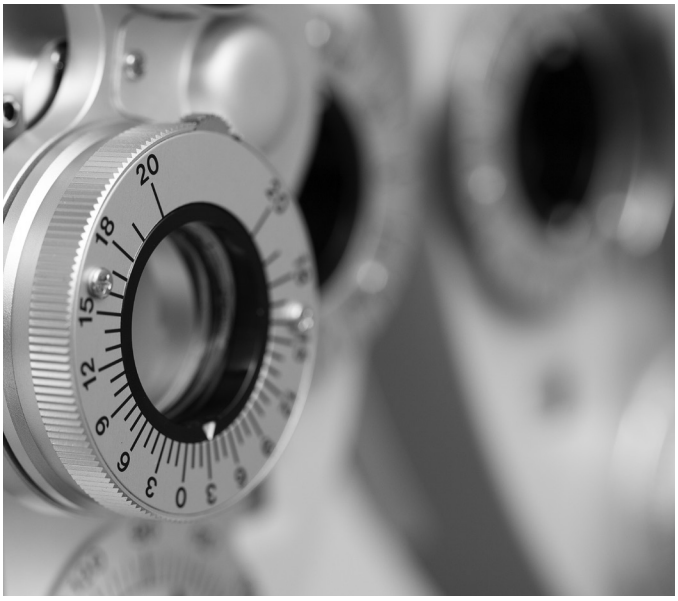
1. Examine the current and future eye health and vision care needs of Canadians and the ability of providers to respond to those needs.
2. Identify strategies to optimize the use of ODs and other members of the eye health and vision care workforce so as to best meet the growing need in Canada.

Needs-based Workforce Planning

Methodologies to determine health human resource (HHR) needs include provider-to-population ratios, demand based, utilization based, and population health needs based. For example, the Canadian Medical Association (CMA) and others report on supply only and/or on number of ophthalmologists per 100,000 population.[9, 10, 8] However, this is a crude and outdated methodology in light of more recent advanced HHR research. Recently Leonard, Sweetman and Zhang projected the supply and demand of optometry services from 2011 to 2036 using a utilization approach, recognizing this methodology is an intersection of demand and supply and not a measure of population need.[11]

> "Claims of HHR shortages imply awareness of both the supply of and requirements for HHR. However, estimates of HHR requirements across countries continue to use simple age and gender standardized provider to population ratios [1–6]. Although such ratios are easily calculated and compared across jurisdictions [7], they are of limited value from a planning perspective [8–10]. Estimating HHR "requirements" in this way assumes that the number of providers alone determines the supply services, that current levels of service provision are (a) optimal and (b) will not change in the future, and that neither the health needs of population nor the productivity of HHR in delivering services will change in the future [11–13]. Contrary to these assumptions, improvements in productivity associated with new technologies, team compositions, and methods of service delivery [14–16] mean that fewer providers are required to deliver the same level of service. Similarly, improvements in age and gender specific levels of health in populations [8, 17, 18] mean that fewer services per capita are needed further reducing the number of providers per age-standardized population. The need for more comprehensive approaches to HHR planning is being increasingly recognized [13, 19–22].[12]

Federal, provincial and territorial governments have endorsed a population health needs-based approach to HHR planning.[6] Birch, Tomblin, Murphy and colleagues have developed an analytical model for population health needs-based HHR planning that has been used across Canada and in other countries for various health professions.[5] See Appendix A for a description.



Approach

This study employs a modified version of the full population health needs-based planning model developed by Birch et al.[5] It was conducted from January to July 2017. Public data and information pertaining to the supply of ODs, ophthalmologists, GP/FPs and NPs, as well as factors impacting the supply of and need for eye health and vision care services have been included. This is not a labour market study. Sources used include:

- Statistics Canada data
- Canadian Institute for Health Information (CIHI) health workforce databases and reports
- National Physician Survey (NPS) results
- Royal College Medical Workforce Knowledgebase
- CMA Masterfile
- Royal College of Physicians and Surgeons of Canada Employment Study
- CAO member survey
- Individual Optometric Regulatory Authority in Canada member statistics
- Canadian Examiners in Optometry annual reports
- Relevant peer review and grey literature

Excluded from this analysis are data pertaining to compensation or health system costs of the various providers.

Study and data limitations can be found in Appendix B.

Need for Eye Health and Vision Care Services

Population Demography

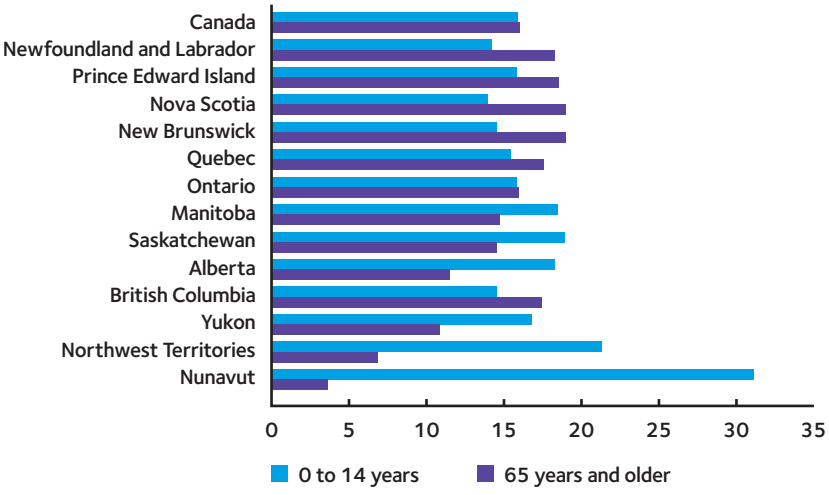
Canada has an aging population. In 2015, for the first time, the number of people aged 65 years and older exceeded those aged 0 to 14 years. Nearly one in six Canadians (16.1%)—a record 5,780,900 people—were at least 65 years old, compared with 5,749,400 who were aged 0 to 14 years (16%). The most recent population projections indicate that those aged 65 years and older will continue to increase and should account for 20.1% of the population on July 1, 2024, while those aged 0 to 14 years should account for 16.3%[13] (see Appendix C).

In 2014–2015, the growth rate of the population aged 65 years and older was 3.5%, approximately four times the growth rate of the total population. The annual growth rate of this age group has accelerated since 2011, when the first members of the baby boom generation (born between 1946 and 1965) turned 65. On July 1, 2015, 18.2% of baby boomers were aged 65 years and older.[14] There is some geographic variation: New Brunswick had the highest proportion of persons aged 65 years and older (19%), while Nunavut had the lowest (3.7%). Of the provinces, Alberta had the lowest (11.6%). Figure 1 shows the demographic growth rate by age for the past 30 years.[14]

The Indigenous community in Canada is increasing six times faster than non-Indigenous people.[15] In 2011, 4% of the Canadian population had an Indigenous identity. About one in five (22%) Indigenous people in Canada resided in Ontario, while 58% lived in one of the four western provinces, 10% were in Quebec, 7% were in the Atlantic provinces and 4% were in in Yukon, Northwest Territories and Nunavut.[16] Almost half this population is below 25 years of age, compared to 30% for the non-Indigenous population.[16]

Canada's population is growing by about three million people every 10 years, primarily due to immigration.[17] More than two-thirds of immigrants originate from countries with a high prevalence of myopia (near-sightedness), such as those in East Asia and Europe.[7]

Figure 1: Proportion of the population aged 0 to 14 years and 65 years and older, as of July 1, 2015, Canada, provinces and territories



Source: CANSIM table 051-0001

Epidemiology

The prevalence of low vision and blindness in Canada is on par with other developed countries, with older age significantly associated with both. The four most common eye diseases causing vision loss in Canada are age-related macular degeneration, diabetic retinopathy, glaucoma and cataracts, all of which are age related. If left untreated, most people with these diseases are at risk of blindness or significant vision loss.[18]

More than 5.5 million Canadians, or one out of six, have one of the four most common eye diseases and are at serious risk of losing their vision.[18] In Ontario alone, over two million people live with a major eye disease.[18] Within the next 20 years the number of Canadians with vision loss is expected to double, in large part due to an aging population.[19] After age 40, the number of cases of vision loss doubles approximately every decade. At age 75, it triples.[3] The number affected will top one million in the next five years and continue escalating.[3] In fact, over the next 10 years, the number of Canadians with vision loss is expected to increase nearly 30%.[2]

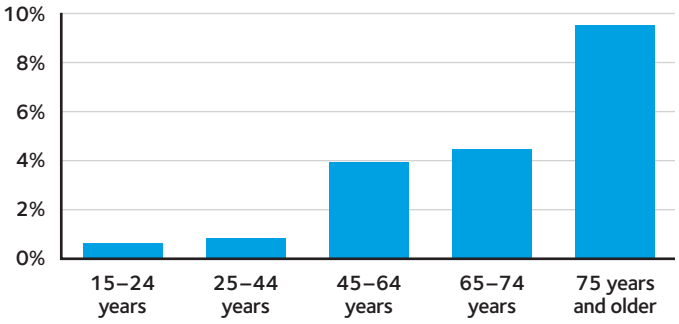
A 2006 Canadian study found that the prevalence of low vision and blindness was 35.6 per 10,000 and 3.8 per 10,000 respectively, according to the World Health Organization (WHO) classification, and 71.2 and 23.6 per 10,000 individuals using the North American definition.[iii] Among individuals with some vision loss (vision worse than 20/40), cataract and visual pathway disease were the most common causes, together accounting for 40% of visual impairment.[20] Using the North

[iii] Categorizations of vision loss (WHO classification and North American definition) available at: http://www.nature.com/eye/journal/v20/n3/fig_tab/6701879t1.html#figure-title

American definition of blindness and low vision, approximately 1% of the population was noted to have a visual impairment. Low vision was estimated to be three times as common as blindness.[20]

The 2012 Canadian Survey on Disability showed that 756,300 (2.8%) of Canadians aged 15 years and older were identified as having a vision disability that limited their daily activities. Of those, only 5.8% indicated they were legally blind.[21] Figure 2 depicts the prevalence of seeing disabilities by age group from the same survey. The difference in seeing disability rates between women and men was statistically significant for those aged 25 to 44, at 1.1% and 0.6% respectively, and for those aged 65 to 74 at 5.1% and 3.7% respectively. It was not statistically significant for other age groups.

Figure 2: Prevalence of seeing disabilities by age group, aged 15 years and older, Canada, 2012



Age-related Major Causes of Vision Loss

Age-related macular degeneration
Age-related macular degeneration (AMD) is an incurable eye disease and a leading cause of blindness in elderly people. The macula is the part of the retina that enables central vision and the seeing of fine detail. Damage to the macula is characterized by a "black spot" where the person loses the centre of the picture. Vision is usually lost with more advanced stages of AMD. "Causes of AMD are not well understood, but may include age and a genetic component, with family history increasing the risk three to four times. People who smoke are twice as likely to develop AMD. People who have a family history of AMD and who smoke are up to 144 times more likely to develop the disease."[22]

There are two types of "late AMD": dry, accounting for about one third of cases; and wet, accounting for the other two thirds. Currently, the only treatment for dry AMD, which usually progresses slowly, is management of risk factors; however promising research is being done to develop effective treatments for dry AMD. With wet AMD, vision loss may be rapid and severe, but medical and/or surgical treatment may slow the progression. Intravitreal injections are used to treat wet AMD. In either type, once the damage is done it is permanent.

Diabetic retinopathy
Diabetic retinopathy (DR) is a complication of diabetes mellitus in which prolonged exposure to elevated blood glucose causes damage to the microvasculature of the retina. It often has no early signs. As the disease progresses, patients can develop complications such as diabetic macular edema, neovascularization (growth of newer leaky blood vessels), vitreous hemorrhage and ischemia (lack of proper blood flow to parts of the eye). These complications can have devastating effects on vision.

Eye examinations with dilation of the pupils to visualize the retina are used to diagnose diabetic retinopathy. Secondary testing such as retinal photography, optical coherence tomography, optical coherence tomography angiography, and fluorescein angiography are also used as required. In certain underserviced areas, screenings that include visual acuity with retinal imaging can be used; however this method has limitations and is not ideal. "To prevent the onset and progression of DR (and the need for surgery), people with diabetes should control their levels of blood sugar, blood pressure and blood cholesterol. Early diagnosis and treatment can prevent almost all severe vision loss. The earlier treatment is received, the more likely it is to be effective."[22]

DR is considered to be the leading cause of blindness in the working-age population in the developed world. It is particularly prevalent in the poor, the elderly, and in ethnic minorities who have greater difficulty accessing health care. Of note, diabetic retinopathy is also common in younger people with type 2 diabetes, particularly with the rise of childhood obesity. It is, however, a largely preventable cause of vision loss that can be controlled through cost-effective interventions.[23] Some British studies have suggested that 5% to 10% of patients with diabetes have DR, with up to 40% of these patients having some degree of retinopathy at diagnosis.[23]

Canada's Indigenous population is at great risk. "With the disproportionate and increasing number of native people with diabetes, and its occurrence at a much earlier age than the general population, diabetes will lead to a more significant burden of preventable vision loss in Aboriginal communities than in non-Aboriginal groups."[24] The year 2011 was declared Aboriginal Vision Health Awareness Year, and it was noted that Indigenous citizens with diabetes are 25 times more likely to experience vision loss and blindness than people without diabetes.

Glaucoma
Glaucoma is a group of diseases that can damage the eye's optic nerve and result in blindness. It is often initially asymptomatic. Increased risk for glaucoma occurs with age, family history and ethnicity. Glaucoma is detected through an eye examination including visual acuity, visual field, tonometry and optic nerve examination. Although there is no cure for glaucoma, early diagnosis and treatment helps protect eyes against serious vision loss and blindness.[22]

Cataracts
A cataract is a clouding or loss of transparency in the eye's lens that forms due to tissue breakdown and protein clumping. Over time, a cataract may grow larger and cloud more of the lens, making it hard to see. "The four main types of cataract are age related (most common),

congenital, secondary (e.g., due to diabetes or steroid use) and traumatic (e.g., due to eye injury). Causes of cataract are still uncertain, although age, smoking, diabetes and ultraviolet exposure have been shown to increase risk."[22] Detection is through an eye examination. Cataract surgery may be indicated to remove the cloudy lens and replace it with a prosthetic lens, improving vision. Surgery is safe and very effective with 95% of those having the procedure in North America having a successful result.[25]

Pediatric Vision Loss

Vision disorders are a common pediatric health problem in Canada and the United States. Ten percent of all preschoolers have vision deficiencies and that percentage increases to 25% for children in kindergarten to grade 6. The incidence of vision problems is much higher in children at risk; Indigenous children have a significantly higher incidence of refractive error.[26] A Canadian pilot study found that nearsightedness in children increases drastically from grade 1 to grade 8, with almost a third of the cases going undiagnosed and uncorrected.[7, 27] The study found that myopia increases from 6% to 28.9% between the ages of 6 and 13. "Historically, myopia started at age 12 or 13, but now it is showing up more often in kids 6 or 7 years old," said Dr. Mike Yang, lead investigator and clinical scientist with the Centre for Contact Lens Research in Waterloo, Ontario. "Our eyesight as a population is deteriorating and at a much younger age."[27]

Sixty percent of children labeled as having learning problems have vision problems.[28] Eighty percent of all learning during a child's first 12 years is visual.[29] Visual deficiencies impair reading acquisition and learning and influence other behavior.[30] Children with astigmatism, hyperopia and other non-myopic visual difficulties, and who can still read distance eye charts, can and do struggle with reading. "Visual impediments to learning are rarely detected in common sight screenings and are associated with limited socioeconomic success, reports of lower intelligence, limited academic and professional success, limited access to the benefits of an enriched childhood environment, and increased criminality."[30] Visual impairment in children is associated with developmental delays and the need for special education, vocational and social services, often beyond childhood into adulthood.[30]

Until recently, childhood diabetes was predominantly due to autoimmune type 1 diabetes. However, youth-onset type 2 diabetes is on the rise[31] with a projected 49% increase in its incidence over the next 40 years.[32] Experts are sounding the alarm because of recent data indicating high treatment failure, and early onset of diabetes-related complications such as DR in these youth.[32] Data on pediatric type 2 diabetes in Canada, although limited to specific populations and geographic regions, indicate that the prevalence is increasing.[31] A Canadian national surveillance study demonstrated a minimum incidence of type 2 diabetes in children and adolescents under 18 years of age of 1.54 per 100,000 children per year. Significant regional variation was observed with the highest minimum incidence seen in Manitoba with 12.45 per 100,000 children per year. Forty-four percent of children with new onset type 2 diabetes were of Indigenous heritage.[31]

Eye Health and Vision Care Services

Numerous services are provided by the eye health and vision care workforce, ranging from limited school screenings (or sight tests) to comprehensive eye examinations. The eye examination includes the assessment and/or diagnostic phase in the care process.

Eye Examinations

The CAO and Canadian Ophthalmological Society (COS) recommend regular eye examinations, as opposed to a simple vision screening, and identify the various components of an eye examination.

A simple vision screening or "sight test" describes a stand-alone refraction that measures the optical lens power required to optimize vision, by relying on a combination of computerized tests using automated equipment. It is not a proper eye examination and is not performed by a trained and licensed eye care professional. These tests overlook many serious eye or health problems and diseases, as the eye itself is not examined during a sight test. On the other hand, a comprehensive eye examination looks at the entire eye and visual system, as well as the optical prescription, and is an important part of preventive health care.

Comprehensive eye examinations can detect eye diseases and disorders such as glaucoma, cataracts, retinal detachments and macular degeneration, and other health problems such as diabetes, high blood pressure and brain tumors.

Usual components of an eye examination[33] include:

- A case history.
- An analysis of the patient's visual needs at home, work, school and play.
- Measurement of the visual acuity of each eye individually and together, both with and without corrective lenses.
- Extraocular muscle assessment (strength and balance) as it relates to individual and binocular (coordination of the two eyes together) eye movements, depth perception and eye-hand coordination.
- Colour vision perception evaluation as required.
- Assessment of the health of the eye itself both inside and outside, and the surrounding structures, using a variety of imaging systems and a dilation of the pupils when indicated, screening for glaucoma, cataracts, retinal pathology and many other ocular conditions, including signs of many systemic conditions.
- A neurological assessment of the visual system including a review of the pupil reactions, ocular muscle reflexes and functions and an assessment of the peripheral vision.
- Diagnosis of the refractive status or prescription (focusing power of the eye) based on a combination of objective (measurements) and subjective (patient responses to questions) techniques.

- Final analysis to determine the appropriate prescription lenses to treat refractive and visual problems, to develop a program of eye training exercises, or to recommend medical or surgical treatment.
- Recommendations for future eye care.

Recommended Frequency of Eye Examinations

The CAO identifies the following eye examination frequency guidelines for those at low risk relative to age:[34]

Infants and Toddlers (Birth to 24 months): first eye examination between the ages of 6 and 9 months

Preschool Children (2 to 5 years): At least one eye examination between the ages of 2 and 5 years

School Age Children (6 to 19 years): eye examination annually

Adults (20 to 39 years): eye examination every 2 to 3 years

Adults (40 to 64 years): eye examination every 2 years

Adults (65 years or older): eye examination annually

COS recommends a slightly different frequency of eye examinations for adults:[35]

Screening intervals in the asymptomatic low-risk patient:

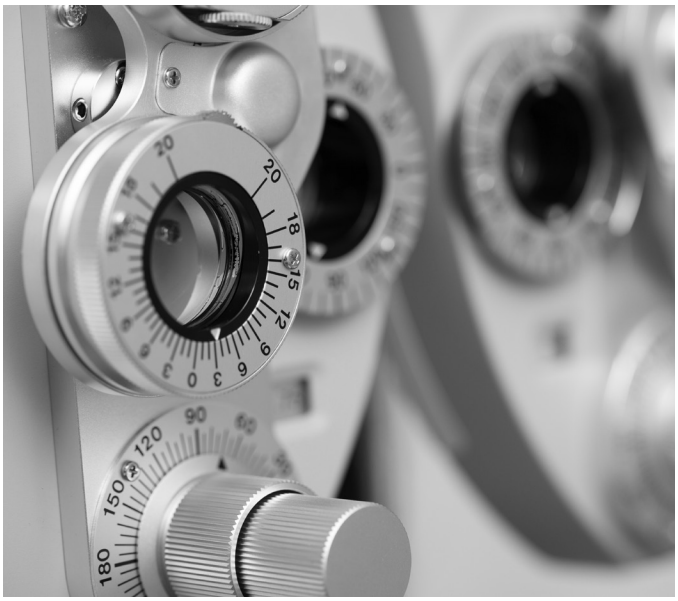
- Age 19–40 years: at least every 10 years
- Age 41–55 years: at least every 5 years
- Age 56–65 years: at least every 3 years
- Age > 65 years: at least every 2 years

Screening in symptomatic patients:
Any patient noting changes in visual acuity, visual field, colour vision, or physical changes to the eye should be assessed as soon as possible.

Screening intervals in high-risk patients:
Patients at higher risk of visual impairment (e.g., those with diabetes, cataract, macular degeneration, or glaucoma [and glaucoma suspects], and patients with a family history of these conditions) should be assessed more frequently and thoroughly.

- Age > 40 years: at least every 3 years
- Age > 50 years: at least every 2 years
- Age > 60 years: at least annually

The Canadian Pediatric Society also has a position statement on vision screening in infants, children and youth.[36] It outlines specific elements of an eye examination at newborn to 3 months of age, 6 to 12 months of age, 3 to 5 years of age and 6 to 18 years of age. However, it differs from the CAO in that it states that routine comprehensive professional eye examinations of healthy children with no risk factors have no proven benefit. It recommends that any infant or child with abnormalities on examination, or who does not pass visual screening, should be referred for further assessment. Infants and children with risk factors, such as developmental delay, should also be fully examined by a well-trained eye care professional.



CAO, COS, the Canadian Pediatric Society, and the College of Family Physicians of Canada (CFPC) are working on a joint Clinical Practice Guideline on periodic eye examinations in Canada for children. This is expected in 2018.

A comprehensive eye examination can be completed by an OD or ophthalmologist, but not an optician, a GP/FP or an NP. A slit-lamp biomicroscope and other specialized equipment are required to perform a comprehensive eye examination, and these are often not available in GP/FP or NP offices.

Eye Examination Use and Associated Barriers

Despite increasing myopia in children, Poe found only 14% of children under six years of age receive professional eye care.[37] A survey commissioned by the CAO reported that 61% of parents mistakenly believe they would know if their child was having difficulty with their eyesight. Many serious eye conditions do not have obvious symptoms and some eye diseases only become apparent when the condition is advanced and difficult to treat. Children accept their vision as normal because they have no point of comparison.[19]

The majority of eye problems are asymptomatic and thus are "silent."[29] According to the CAO Optometry Incident Reporting Analysis from December 2011 to June 2015, 77% of incidents reported existed in asymptomatic patients for both ocular and systemic disease. This suggests the underlying value of frequent eye examinations to identify ocular disease as well as chronic conditions such as diabetes, high cholesterol and hypertension. Early intervention for high-cost chronic diseases can improve health outcomes and reduce health care costs. However, 27% of patients wait more than five years between comprehensive eye examinations. An additional 39% of patients wait between two and five years between examinations. Later diagnosis and treatment contributes to increased morbidity and irreversible vision loss. Thirty-one percent of ODs indicate their patients previously had a sight test but did not understand the difference between a sight test and an eye exam.[38]

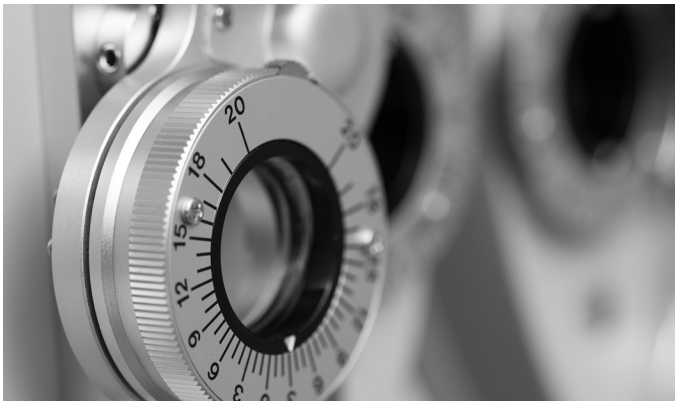
According to a study examining data from the 2007–2008 Canadian Community Health Survey (CCHS), across Canada, 45.6% of adolescents used eye health and vision care providers over a 12-month period. The rate was highest (46.4%) in provinces with insured routine eye examinations, lower (35.9%) in provinces without insured routine eye examinations, and lowest (27.1%) in the three territories. After adjusting for confounding effects, the authors found that adolescents living in provinces with uninsured routine eye examinations were 24% less likely to use eye health and vision care services; whereas those in the three territories were nearly 40% less likely to use these services compared to adolescents in provinces with insured routine eye examinations.[39] Lack of publicly funded eye care insurance for routine eye examinations negatively impacts an adolescent's access to eye care providers in Canada.

An earlier study using 2005 CCHS data found marked disparities in utilization of eye care services over a 12-month period among Canadians without known eye diseases.[40] The authors found a substantial proportion of people at a high risk of vision loss do not access eye care providers: 14% of glaucoma patients, 37% of diabetic patients, and 41% of people aged 65 years or older. The study also found that residents of Newfoundland and Labrador used eye care providers significantly less than residents of other provinces. The authors suggest attributable factors as incomplete government coverage, asymptomatic ocular diseases, and lack of perceived benefits of eye care services are barriers to accessing eye services. A lack of private insurance coverage would be another factor.

A community-based inquiry into vision care access for a rural northern Indigenous community found levels of community awareness surrounding on-reserve eye care services to be a barrier.[41] Participants believed good community awareness existed about the on-reserve eye care services. However, responses about the frequency and location of these services varied. The barriers cited most often in the interviews were economic and travel barriers leading to a preference for on-reserve care. Participants felt that having on-reserve care helped eliminate many of the barriers to accessing care, including the cost of exam and understanding insurance, travel, and language barriers. However, drawbacks to on-reserve care include low frequency of service availability (e.g., clinics travel intermittently) and the challenge of finding practitioners to travel to rural or remote communities.

Changing Modalities of Eye Examinations

New modalities for the provision of eye health and vision care services are being developed, including more use of the Internet. For example, there are currently at least 11 online and mobile app-based programs available in the United States that tout online exams and online refractions, and allow users to renew or fill their contact lens prescription and "provide corrective relief" without seeing a doctor. This is more than triple what was offered at this time last year, with new products rapidly being developed.[42] This trend and other disruptive technologies are expected to extend to Canada. These modalities have limited value beyond basic vision screening, are unregulated in terms of quality and efficacy and, from an overall eye health perspective, are not equivalent to a comprehensive eye examination and may significantly delay appropriate professional care. The CAO has expressed concern about the safety of online eye exams.[43]



Innovations in Eye Care Services

Comprehensive eye examinations discussed above are only one of the many services provided by the eye health and vision care workforce. The comprehensive examination may be followed by treatment, specialized examinations, referrals and follow-up. The nature of these services is changing as knowledge increases, new technologies emerge, new products come to market, pharmaceuticals evolve and population health needs change.

A keynote presentation at the Optometric Leaders Forum hosted by the CAO in January 2017 provided insight into the changing face of eye care.[44] New pharmaceuticals or pharmaceutical formats are coming to market each day, improving the treatment of many eye conditions including the four most common ones. For example, PAN-9086, a potent and selective inhibitor of vascular endothelial growth factor has been through phase I and II clinical trials in the United States and has been found to be effective in 50% of treated individuals for the treatment of wet AMD, macular edema and DR. It is available as a topical medication. A new biological corneal bandage device has received FDA approval in the United States to heal and treat eye diseases such as keratitis, common dry eye, neurotrophic corneas, corneal erosions, etc. Other emerging therapies include regenerative medicine, which is an ophthalmic matrix therapy agent that "triggers regeneration of damaged tissues for enhanced healing" by restoring corneal matrix architecture. Many new drugs are in late clinical trials to treat glaucoma.

Technology is also advancing eye care. Nanotech contact lens delivery is being tested and 3D printing is being used to produce single use and reusable ophthalmic lenses. New mobile refractometer and vision analyzers allow the provider to go to the patient, as opposed to the patient coming to the provider. Another example is optical coherence tomography angiography that provides clear, 3D, dye-free visualization of microvascular blood flow in a single scan.

Companies developing novel treatments to replace damaged corneas are expected to launch in Japan in 2018.[44] Stem cells were successfully used to treat congenital cataracts in 12 babies in which the infants "regrew" functional lenses.[45]

The field of eye health and vision care diagnosis and treatment is rapidly changing. Whatever the future brings, these changes will have significant implications for the need for services and for the providers who deliver those services.

First, they will affect future epidemiology, possibly altering the projected prevalence of the four most common eye conditions and/or the duration of the conditions. Second, they will change the type of services provided and the amount of effort providers expend in treating eye conditions and diseases (i.e., new surgical interventions may be developed). Third, they have implications for the eye health and vision care workforce and their practices. Providers need to keep abreast of advances and develop competence in new technologies, treatments and pharmaceuticals. As scope of practice changes, so too may the required future mix of providers. For example, conventional surgical treatments only provided by ophthalmologists today may in the future be topical applications that can be safely provided by ODs. The educational curricula and regulatory standards of practice of all eye health and vision care providers will need to be adapted to prepare providers to safely practice in a new reality.

Unmet Need: Wait Times

Wait times are considered by some to be an indicator of unmet need for a particular service. There are no public standardized wait times to see an OD. Provincial CAO members were informally surveyed in March 2017 to determine average wait times to see an OD. The results are shown in Table 2.

Table 2: Wait times to see an OD, reported by CAO provincial members, 2017

PROVINCE	Urgent Visit Wait Time	Non-Urgent Visit Wait Time
NL	Same day	1–2 days to 1 week
PE	Same day	Unknown
NB	Same day	1–2 weeks
NS	Same day	Not significant
QC	Same day	Unknown
ON	Same day (89.5%)	Unknown
MB	92% within one day 8% in 2 days	46% within 5 days 69% within 1 week
SK	Same day	1–2 days: 36.4% 3–14 days: 60.6% 2 weeks–1 month: 3% More than 1 month: 0%
AB	Same day	Not significant
BC	Same day	Unknown

For ophthalmologists, public standardized data on wait times are available for cataract surgeries only. According to a recent CIHI report, patients are waiting longer for cataract surgery, but some provinces show improvement.[46]

- Across Canada, there has been a decline in the proportion of patients receiving cataract surgery within the benchmark of 112 days, from 83% in 2012 to 73% in 2016.
- The median wait times increased in Canada over this period. Half of the patients received cataract surgery within 67 days in 2016 versus within 47 days in 2012.
- The provincial median wait times ranged from 37 to 148 days in 2016.
- Trends in the percentage of provinces meeting the benchmark are inconsistent. Since 2012, the percentage of patients receiving cataract surgery within the benchmark has declined in four provinces (New Brunswick, Ontario, Alberta and British Columbia) and improved in four provinces (Newfoundland and Labrador, Prince Edward Island, Nova Scotia and Saskatchewan).

The definition for a wait time measurement used in the CIHI report "begins with the booking of a service, which is when the patient and the appropriate physician agree to a service, and the patient is ready to receive it."[47] The benchmark and reported actual days do not include the time the patient waits to see the ophthalmologist once referred by an OD, a GP/FP or an NP.

Ophthalmologists, like many other specialty surgical disciplines, require resources such as operating room time to function efficiently. "With health care spending challenges, specialists often have limited access to such resources, which affects the number able to practice as well as how much work each specialist can undertake."[48] Limited funding and operating room time for cataract surgery contributes to longer wait times than recommended. However, ensuring ophthalmologists' time is focused on patients requiring their unique competencies and expertise can help reduce wait times.

People with an eye condition often access services provided by their GP/FP or NP as a first point of contact, in part because these services are covered under the publicly funded health system in all provinces and territories. The coverage for publicly funded eye examinations varies greatly across the country, as shown in Appendix D. There are no public wait times data available for NPs working specifically in primary care. According to a 2015 international survey of primary care doctors, only 53% of Canadian primary care doctors report that most of their patients who request a same- or next-day appointment can get one.[49] This places Canada second to last of the 10 countries participating in the survey and well below the Commonwealth Fund average of 72%. However, timely access to primary care has improved. One-third more doctors in Canada are able to provide same- or next-day access in 2015 than in 2009. See Figure 3.

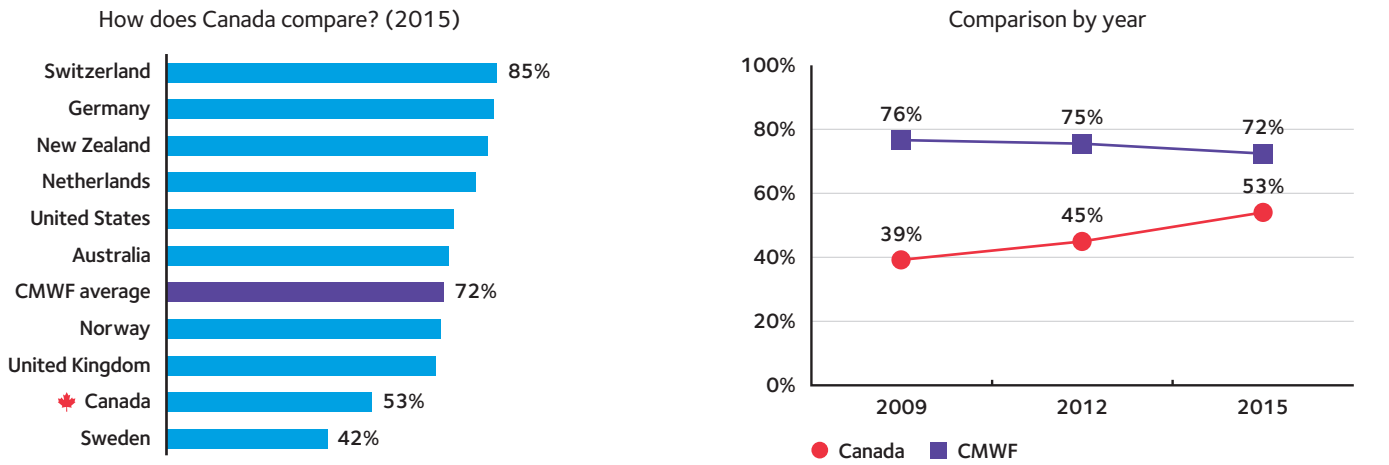
Many Canadians use emergency departments for their eye health needs that could more appropriately be met by primary eye care providers in other settings in the community. In 2013–2014 there were 36,641 emergency department visits for conjunctivitis in Canada, representing 3% of all visits that would have been better cared for in another setting.[50] Timely access to the most appropriate eye health and vision care provider could reduce these inappropriate visits.

Workforce Productivity

The number of health professionals required to provide the services needed to meet population eye health and vision care needs can vary, depending on a number of factors that affect the productivity of the workforce. This begins with hours worked (including routine and on call/overtime) and how many of those hours are focused on direct patient care.[iv] Another contributing factor is how the model of care is configured—and how a provider is used in each model of care. Working to optimal scope of practice can positively impact workforce productivity, preventing unnecessary referrals. If providers are working in a true team environment and practice effective collaboration, higher productivity is expected.

Technology also has the potential to optimize the number of services provided by the workforce in a set timeframe. New technologies such as optical coherence tomography, corneal topographers and visual field analyzers can extend the reach of the workforce, improve the effectiveness of the care, and potentially speed up procedures to allow each professional to see more patients per day.

Figure 3: Timely access to primary care doctors in Canada

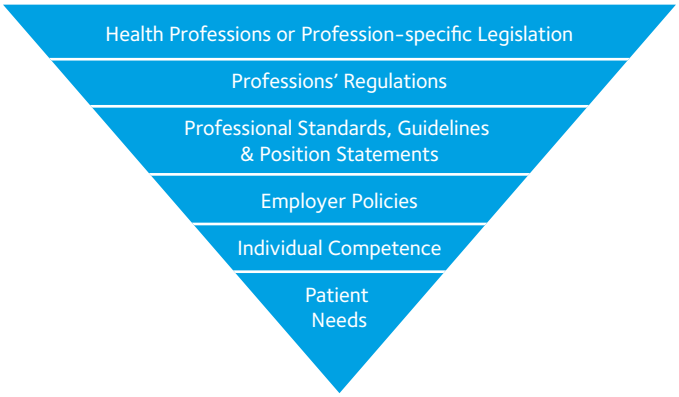


[iv] In this report "patient care" reflects person- and family-centred care.

Supply of Eye Health and Vision Care Services

As noted, ODs, ophthalmologists, GP/FPs and NPs in Canada provide eye health and vision care services to varying degrees. Following is an overview of each profession and the services they can provide, as well as a discussion about overlapping scopes of practice. As the legislated/regulated competencies of each are defined using different frameworks, they are not fully comparable. Figure 4 represents the outer boundaries of the professional scope of practice. Much of the detail is further defined in their legislated scope of practice and college policies, standards, and guidelines that vary across the country. In addition, practice may be further limited by employer policies or by the provider's own experience or level of competence. Each provider has their own individual competencies. For example, some may no longer treat children or infants for eye health and vision care because they do not feel competent doing so as they have not treated children for years.

Figure 4: Layers of Scope of Practice



Service Descriptions by Profession

Optometrists (OD)
ODs are independent primary health care providers who represent the front line of vision health. Services they provide include:

- Examination, diagnosis, treatment, management and prevention of disease and disorders of the visual system, the eye and associated structures
- Diagnosis of ocular manifestations of systemic conditions such as diabetes and high blood pressure and complications of the aging process such as cataracts and macular degeneration
- Prescribing medication to treat certain eye diseases
- Prescribing and fitting eyeglasses and contact lenses as well as safety eyewear and subnormal vision devices
- Providing vision therapy and low-vision rehabilitation
- Working in conjunction with other health care providers to provide integrated, quality care for patients
- Educating patients about vision health and lifestyle choices for protecting and enhancing good vision and health
- Conducting research and promoting advancement in the vision sciences

The legislated scope of practice of ODs differs slightly across the country—Appendix E provides a complete overview. The key difference is that not all jurisdictions allow ODs to prescribe certain topical preparations or oral medications for treating eye disease.

Ophthalmologists
Ophthalmology deals with the screening, diagnosis and management of optical, medical and surgical disorders and diseases of the eye, associated orbital structures and neuro-visual pathways. The specialty relies on a combination of diagnostic, medical and surgical skills. Most surgical interventions are microsurgical requiring excellent fine-motor manual dexterity.[8] Ophthalmologists perform comprehensive eye exams, conduct surgery, prescribe and administer medication and prescribe corrective lenses.[51] Ophthalmologists operate within a specific area of expertise but on a broad range of patients, from newborns to geriatric patients.[8]

There are a number of subspecialties within ophthalmology, including cornea and external disease, glaucoma, neuro-ophthalmology, ophthalmic pathology, ophthalmic plastic surgery, pediatric ophthalmology, retina, uveitis and low vision.

There is no publicly available document detailing the scope of practice for ophthalmologists.

General Practitioners/Family Physicians (GP/FP)
GP/FPs provide comprehensive care for patients and their families in the community, with a focus on prevention, management of chronic disease and coordination of care. GP/FPs provide care in a variety of settings, including medical clinics, emergency departments, acute care settings and patients' homes.[52] "The clinical responsibilities of family physicians span the spectrum of medical care: health promotion and disease prevention; diagnosis; acute treatment, including the management of life-threatening illness; chronic disease management; rehabilitation; supportive care; and palliation."[53]

It is estimated that GP/FPs receive six to seven days of content on eye care in their undergraduate education. As defined in the *Medicine Act* in Ontario, the legislated scope of practice is broadly defined as: "the practice of medicine is the assessment of the physical or mental condition of an individual and the diagnosis, treatment and prevention of any disease, disorder or dysfunction."[54] It then states "in the course of engaging in the practice of medicine, a member is authorized, subject to the terms, conditions and limitations imposed on his or

her certificate of registration, to perform the following" and lists the authorized acts. One of them, as it pertains to eye care, is "Performing a procedure on tissue below the dermis, below the surface of a mucous membrane, in or below the surface of the cornea...."

What is publicly available is a list of eye procedures (provided below) that are identified as a key skill of family physicians, as well as key features expected for the presentation of red eye. In a survey of practicing family physicians, only 2% identified red eye as the most important problem or clinical situation that a newly practicing family physician should be competent to resolve.[55]

Eye procedures:

- Instillation of fluorescein
- Slit-lamp biomicroscope examination
- Removal of corneal or conjunctival foreign body
- Application of eye patch

Of note, many GP/FPs would not have a slit-lamp biomicroscope at their disposal and thus may be limited in the comprehensiveness of their examination and ability to diagnose and treat.

Nurse Practitioners (NP)

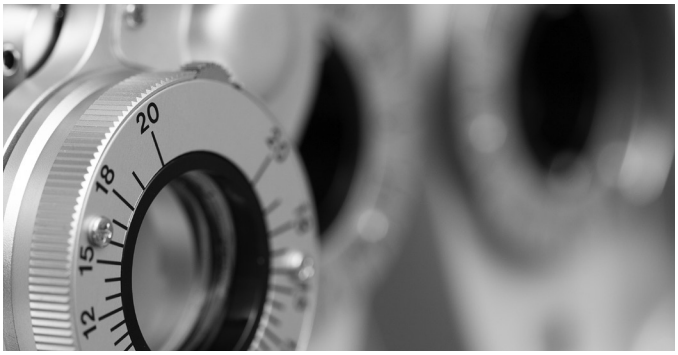
According to the Canadian Nurses Association,[56] "NPs are registered nurses with additional educational preparation and experience who possess and demonstrate the competencies to autonomously diagnose, order and interpret diagnostic tests, prescribe pharmaceuticals and perform specific procedures within their legislated scope of practice. The NP role is derived from blending clinical diagnostic and therapeutic knowledge, skills and abilities within a nursing framework that emphasizes holism, health promotion and partnership with individuals and families, as well as communities." NPs share national competencies across the country but differ slightly in the legislated scope of practice.

An entry-level family NP, such as is the case in British Columbia, commonly diagnoses and manages independently or refers/consults as appropriate regarding the following diseases, disorders and conditions of the eye:[57]

Blepharitis	Chalazion
Conjunctivitis	Simple corneal abrasion
Nasolacrimal duct obstruction	Simple foreign body
Hordeolum	Cataracts
Glaucoma	Periorbital cellulitis
Uveitis	

NPs will refer to a physician at any point as deemed necessary or as per accepted guidelines. Referrals are made in accordance with established standards for NP-physician consultation. Similar to GP/FPs, NPs may not have a slit-lamp biomicroscope at their disposal, thus limiting their scope of practice in this area.

While the scope of practice of NPs differs slightly across country, NPs in all provinces/territories can consult with and refer patients to specialists, including ophthalmologists. However, in Quebec, primary care NPs may make referrals to specialists only if certain conditions are met, and NPs in other specialties do not have the authority to refer to specialists.[58]



Overlapping Scopes of Practice

While there are unique competencies and scopes of practice among eye health and vision care professionals, there is also overlap in some areas. For example:

- GP/FPs and NPs are similar in their competencies and skills with regard to eye care
- All four groups can diagnose a condition and prescribe medications, order topical antibiotics, and remove a corneal or conjunctival foreign body
- ODs and ophthalmologists can prescribe corrective eye wear and fit for contact lenses
- ODs and ophthalmologists have more extensive training and experience, and access to specialized equipment to diagnose and manage a broad range of eye and vision conditions
- While ODs treat eye conditions and may co-manage eye diseases with ophthalmologists, they do not perform eye surgery, whereas ophthalmologists do

Almost four out of five ophthalmologists (78%) report that other health professionals are providing services that overlap with theirs. Almost all of the ophthalmologists surveyed (98%) indicated ODs as the primary group that provide some components of the care they provide.[59] While this can provide flexibility in the system in terms of access to care, it can also lead to inappropriate use of health professionals, as the public may become confused as to which provider to see for eye health and vision care services.

To determine optimal scopes of practice, clearly defined roles and tasks are important.[60] This necessitates effective collaboration. According to the authors of a study by the Canadian Academy of Health Sciences

on optimal scope of practice, "we identified an emerging consensus that optimizing scopes of practice paired with supporting evolving models of shared care can provide a multidimensional approach to shift the health care system from one that is characteristically siloed to one that is collaborative and patient-focused."[60] The authors go on to suggest that increased flexibility around scopes of practice and models of care is required to meet the changing population health needs and diversity of communities across Canada.[60]

An important component of effective collaboration in health care is an awareness of the scope of practice of fellow providers in the field. In a survey of OD provincial associations, all of them felt that physicians and nurse practitioners have low to average awareness of the OD scope of practice; ophthalmologists have average to strong awareness.[61] In terms of collaboration, a 2016 survey of ODs found that 88% work in close collaboration with ophthalmologists, 70% with GP/FPs and only 20% with NPs.[62] The low level for NPs may be a reflection of the relatively low number of NPs in Canada as compared to GP/FPs.

Workforce Demographics

Overall Numbers

Table 3 presents the number and percent change for each of the eye health and vision care provider groups in Canada between 2010 and 2015. This timeframe is used as there are no 2016 data available for NPs.

Clearly GP/FPs comprise the largest segment of the workforce; however, generally only a small portion of their time is devoted to eye health and vision care. Exactly how much is unknown. NPs are the fastest growing profession but again, only a smaller portion of their clinical services is devoted to eye health and vision care. Ophthalmologists represent the smallest segment of the workforce and show the smallest increase in size. However, all of their clinical services are devoted to eye health and vision care. The OD workforce continues to grow at a rate three times that of ophthalmologists, and 100% of their time is devoted to eye health and vision care.

Table 3: Number of providers in eye health and vision care and percent change, 2010–2015

	N		% change
PROFESSION	2010	2015	
ODs	4,841	5,860	21.0
Ophthalmologists	1,137	1,221	7.4
GPs/FPs	36,024	40,571	12.6
NPs	2,554	4,353	70.4

Sources: NP data from CIHI. (2016). Regulated Nurses, 2015: RN/NP Data Tables; OD data from CIHI report on all health prof; Ophthalmologists and GP/FPs data from the CMA Masterfile: Number of Physicians by Province/Territory and Specialty, Canada, 2010 and 2015

Age Distribution

As shown in Figure 5, the age distribution of ODs is relatively young, with the largest segment (36.5%) being 25 to 35 years.[62] These 2016 findings are consistent with those of the 2013 survey.

Figure 5: Self-reported age group of ODs, 2016

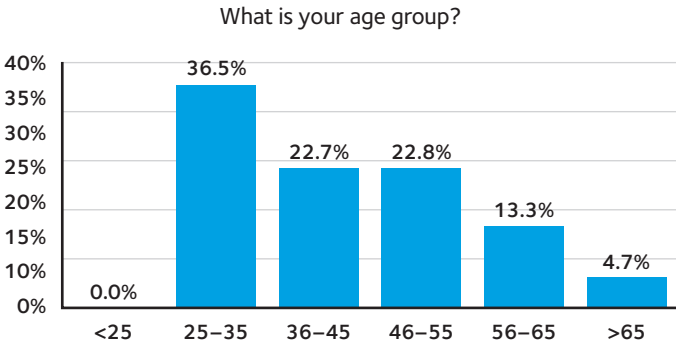
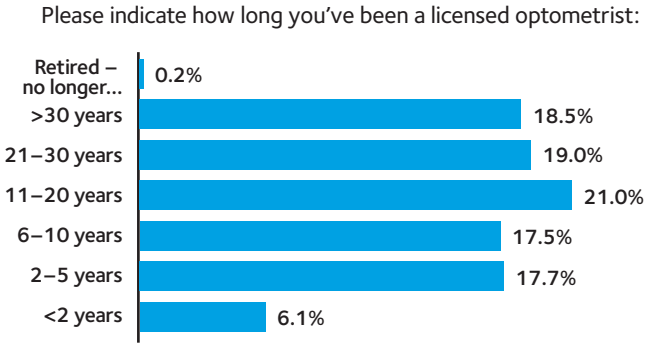


Figure 6 shows that respondents have been licensed ODs for 2 to more than 30 years, with a slight majority in the 11 to 20 years licensed grouping.

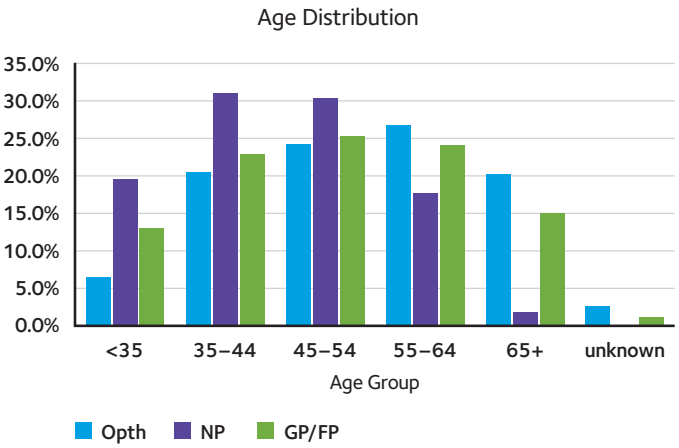
Figure 6: Self-reported years as a licensed OD, 2016



Data from optometry regulatory bodies indicate a 2016 average age of 44.5 years. The lowest average age was in Alberta at 39.9 years old and the highest was in Newfoundland and Labrador at 46.[63] Almost 90% of ODs responding to a 2016 survey state they do not plan to retire in the next two years, consistent with the younger OD profile.[62]

Figure 7 depicts the age distribution for ophthalmologists, NPs and GP/FPs. ODs are not included in this figure as their data are based on different age groupings. The largest proportion of ophthalmologists in 2016 was the 55 to 64 year old group. There are twice as many aged 65 and over compared to those under 35. The mean age of the ophthalmology workforce has been greater than all other physicians since 1972, by a mean of 2.4 years.[64] NPs are the youngest workforce of the three, with over 50% under the age of 44. The average age of NPs is 44.8 with the youngest being in Quebec at 37.1 and the oldest in Northwest Territories and Nunavut at 50.0.[65] This may be related to NPs being a newer role compared to the other providers.

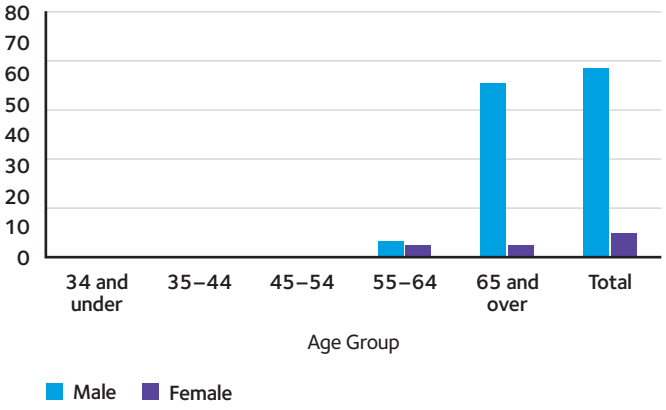
Figure 7: Age distribution of GP/FPs, NPs and ophthalmologists, 2015 and 2016



Sources: Ophthalmologists: CMA Masterfile, 2016 data, Canadian Medical Association; NPs: CIHI. (2016). Regulated Nurses, 2015: RN/NP Data Tables; GP/FPs: Royal College MWK 2015 data

An older ophthalmology workforce lends itself to significant numbers of retirees. Figure 8 provides a picture of the number of recent retirees.

Figure 8: Number of retirees during the three-year period of 2013–2015 for ophthalmologists



Source: CMA Masterfile – year over year comparisons
Note: "Retired" is based on giving up license and therefore excludes those who have retired from clinical practice but are still licensed; those younger than 45 may include physicians who have temporarily given up their license but return to practice at a later date.

Geographic Distribution

Table 4 presents a geographic breakdown of each of the eye health and vision care professions by number and as a percentage of the total eye health and vision care workforce in Canada. Of note is the lack of ODs in the territories and that there is only one ophthalmologist serving all of the territories. This table is difficult to interpret as the percentage of NP and GP/FP time devoted to eye care is unknown.

Table 5 presents perhaps a more meaningful breakdown of the composition of the workforce of those providers who are entirely devoted to vision and eye health. There are five times as many ODs as ophthalmologists Canada wide. Saskatchewan, Manitoba, Alberta and Ontario are below the Canadian average in terms of the percentage of the workforce comprising ophthalmologists.

Table 4: Count and percentage of eye health and vision care workforce by province and territory, 2015 and 2016

	CANADA		NL		PEI		NS		NB		QC	
PROFESSION	N	%	N	%	N	%	N	%	N	%	N	%
ODs (2016)	6,093	11.4	61	5.6	21	9.7	132	8.0	124	8.9	1,549	12.6
Ophthalmologists (2016)	1,213	2.3	17	1.6	6	2.8	44	2.7	26	1.9	349	2.8
GPs/FPs (2016)	41,719	78.2	873	80.3	172	79.6	1,335	80.4	1,130	81.35	10,136	82.2
NPs (2015)	4,353	8.2	136	12.5	17	7.9	149	9.0	109	7.9	305	2.5
TOTAL	53,378	100	1,087	100	216	100	1,660	100	1,389	100	12,339	100

	ON		MB		SK		AB		BC		TERR	
PROFESSION	N	%	N	%	N	%	N	%	N	%	N	%
ODs (2016)	2,347	12.2	165	9.3	183	10.6	766	11.9	745	10.2	0	0
Ophthalmologists (2016)	419	2.2	29	1.6	26	1.5	105	1.6	191	2.6	1	0.6
GPs/FPs (2016)	13,996	72.6	1,422	80.4	1,325	77.0	5,149	80.3	6,050	82.9	131	72.0
NPs (2015)	2,520	13.1	152	8.7	186	10.8	414	6.43	315	4.3	50	27.5
TOTAL	19,282	100	1,768	100	1,720	100	6,434	100	7,301	100	182	100

Sources: GP/FPs and ophthalmologists data from CMA Masterfile: Number of Physicians by Province/Territory and Specialty, Canada, 2016; NP data from CIHI. (2016). Regulated Nurses, 2015: RN/NP Data Tables; OD data from regulatory bodies, 2016

Table 5: Count and percentage of professions exclusively providing eye care, 2016

	CANADA		NL		PEI		NS		NB		QC	
PROFESSION	N	%	N	%	N	%	N	%	N	%	N	%
ODs	6,093	83.4	61	78.2	21	77.8	132	75.0	124	82.7	1,549	81.2
Ophthalmologists (2016)	1,213	16.6	17	21.8	6	22.2	44	25.0	26	17.3	349	18.4
TOTAL	7,306	100	78	100	27	100	176	100	150	100	1,898	100

	ON		MB		SK		AB		BC		TERR	
PROFESSION	N	%	N	%	N	%	N	%	N	%	N	%
ODs	2,347	84.9	165	85.01	183	87.6	766	87.9	745	79.6	0	0
Ophthalmologists (2016)	419	15.2	29	15.0	26	12.4	105	12.1	191	20.4	1	100
TOTAL	2,766	100	194	100	209	100	871	100	936	100	1	100

Sources: GP/FPs and ophthalmologists data from CMA Masterfile: Number of Physicians by Province/Territory and Specialty, Canada, 2016; NP data from CIHI. (2016). Regulated Nurses, 2015: RN/NP Data Tables; OD data from regulatory bodies, 2016

Geographical disparities also exist within provinces such as Ontario.[66, 67] One of the studies found that counties with an ophthalmology residency program have the highest ratio of ophthalmologists to population.[67]

A 2016 survey of its members by the CAO found that ODs' primary practices are located in a variety of sizes of towns and cities, with almost one third in cities with a population greater than 500,000. More than 20% work in communities with populations of less than 25,000. In comparison, 82% of ophthalmologists work in urban or suburban settings; 12% in small towns; 2.8% in rural; and none in remote.[68] GP/FPs and NPs are similar to each other with 14.5 % and 18.3% respectively working in rural and remote areas.[69, 65]

Employment/Hours Worked

A standardized common definition and metric of full time or full time equivalent does not exist for this workforce, making comparisons of full time or worked hours impossible. One study of ophthalmologists found that while male and female ophthalmologists work the same number of hours per week, 51% of females perform surgery less than two days per month versus 36% of males, a statistically significant difference.[70] The percentage of the female ophthalmology workforce is increasing, rising from 16.3% in 2010 to 25% in 2016.[71] This may be a factor in cataract surgery wait times.

In addition, data on hours worked from the most recent National Physicians Surveys (2013 and 2014) are not comparable over time, so trending is limited. In 2013, the greatest percentage (62.8%) of ophthalmologists stated they worked 37 to 46 weeks a year. More than a quarter (25.9%) planned to reduce their weekly worked hours (excluding on call) in the next two years. In 2014, ophthalmologists were asked their average weekly work hours, excluding on-call activities. As per Table 6, they worked a mean total of 50 hours per week. Approximately 36 hours per week were focused on direct patient care with another 4.63 devoted to indirect patient care.

In comparison, in a 2016 survey 40.1% of ODs reported working a total of 31 to 40 hours per week in all aspects of their practice. The majority spent 75 to 100% of their time seeing patients and less than 25% of their time on dispensing, managing, marketing and research. While it appears ophthalmologists worked more hours per week than ODs, both spent more than 70% of their time on direct patient care.

Table 6: Hours Worked Per Week by Ophthalmologists, 2014

ACTIVITY		OPHTHALMOLOGY
Direct patient care without a teaching component	Mean	29.93
Direct patient care with a teaching component	Mean	6.40
Teaching/educating without direct patient care	Mean	1.07
Indirect patient care	Mean	4.63
Health facility committees	Mean	.66
Administration	Mean	1.5
Research	Mean	1.13
Managing your practice	Mean	2.09
CME/CPD	Mean	2.25
Other activities	Mean	.53
Total hours	**Mean**	**50.18**

A study by the Royal College of Physicians and Surgeons on physician employment found that 43.3% of new ophthalmology certificants (a 36% survey response rate) reported being unable to find a job placement.[48] Key informant interviews and survey findings revealed that the surgical and more resource-intensive specialties and subspecialties, which are highly dependent on operating room and other hospital resources for their clinical practice, were the ones that had the greatest employment challenges. "Key informants commented that, because of the high cost of running operating rooms, one of the first areas that Canadian hospitals will 'cut' when experiencing budget constraints is available OR time."[48]

Future Workforce: Training Capacity

ODs

ODs complete a minimum of three years of undergraduate education, preferably in the sciences (in Québec two years of CEGEP is accepted at the undergraduate level), followed by a four-year Doctor of Optometry degree from an accredited university school of optometry. There are two in Canada and 24 in the US, all of whose graduates are eligible to practice in Canada.

In Canada, the University of Montreal graduates approximately 45 students each year and the University of Waterloo graduates 85 to 90 students each year.[72] There is no reporting of OD graduates by CIHI.

In 2015, 135 Canadian students wrote the national licensing exam for the first time and 89.7% (113) passed. Nine candidates wrote for the second time and all passed, for a total number of 122 Canadian

graduates eligible for practice. An almost equal number (115) of US and international students wrote and passed the licensing exam, suggesting that a large number of OD students studying abroad come to Canada to practice.

Ophthalmologists

Becoming certified in ophthalmology requires an additional five years of Royal College-approved residency training after completion of medical school. Training includes:

- One year of basic clinical training.
- Four years of Royal College-approved residency in ophthalmology, including sufficient experience to achieve competency in performing procedures such as topical and regional anesthesia of the eye and periocular structures, laser therapy, surgery (for cataract, enucleation, eyelids, glaucoma, etc.), surgical management of trauma to the eye, ocular adnexa and orbit, ultrasound examination of the eye and interpretation of diagnostic imaging of the eye and visual system.[8]

The number of filled ophthalmology residency positions has remained fairly stable over the last few years, with 37 in 2010, rising to 40 in 2014 and again in 2015.[73, 74] These represent 100% filled positions.

In 2013, there were 43 graduates in ophthalmology, 38 in 2014, and 86 in 2015 due a large influx of international medical graduates and those with a visa.[73, 75] Previous supply-based models calculated that 45 Canadian residency training positions would be needed each year from 2006 to maintain the status quo to 2016, based on inflow and outflow and ophthalmology-to-population ratios.[76] This has not been the case. Recent data show that from 2013 to 2015 there was an average of 47 retirees per year. Current graduate numbers may not be enough to replace the outflow of retirees.

GP/FPs

After completion of medical school, an additional two years of College of Family Physicians of Canada (CFPC) approved residency training is required to become certified in family medicine. An optional third year of training (R3) is available to graduates interested in further specialization in areas such as emergency medicine, maternal and child health, care of the elderly, etc. Otherwise, medical graduates can choose not to specialize and practice as a general practitioner.

The number of filled family medicine residency positions increased from 1,460 (representing 98.2% filled positions) to 1,467 positions in 2015 (representing 97% filled).[77]

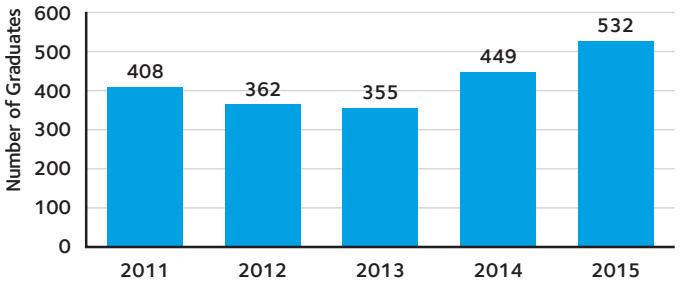
A total of 2,813 MD degrees were awarded in Canada in 2015. This number has been steadily increasingly for decades, with slight regressions in some years. It represents a 15% increase since 2010. MDs are eligible for post-graduate education to specialize or can choose to practice as a general practitioner.

The number of graduates from family medicine residency programs receiving CFPC certification increased 37%, from 1,117 in 2010 to 1,533 in 2014.

NPs

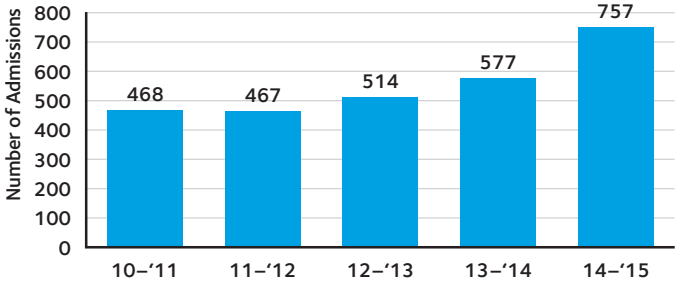
NP programs are offered at three educational levels: post-RN, master's, and post-master's. The majority are at a master's level. Entrants into the program must already be a registered nurse. The number of graduates from NP programs has been increasing over the last few years; there were 532 in 2015, as shown in Figure 9. This is expected to rise significantly given the admission numbers shown in Figure 10.

Figure 9: Graduates from NP Programs 2011–2015



Source: National Student and Faculty Survey of Canadian Schools of Nursing

Figure 10: Admissions to NP Programs 2010–2011 to 2014–2015



Discussion

The need for eye health and vision care services in Canada will continue to grow, in part due to an aging population. One out of every six Canadians is at serious risk of experiencing vision loss in the future. Within the next 20 years, the number of Canadians with vision loss is expected to double, in large part due to an aging population. The four most common eye diseases—age-related macular degeneration, diabetic retinopathy, glaucoma and cataracts—are all age-related. After age 40, the number of cases of vision loss doubles approximately every decade. At 75, it triples. According to Statistics Canada population projections, the share of persons aged 65 years and older will continue to increase and should account for 20.1% of the population in 2024. In 2014–2015, the growth rate of the population aged 65 years and older was approximately four times the growth rate of the total population. Use of eye care services among seniors and other vulnerable segments of the population is suboptimal. A significant proportion of people at a high risk of vision loss—14% of glaucoma patients, 37% of diabetic patients, and 41% of people aged 65 years or older—do not access eye care providers.

Seniors are not the only group in need of eye health and vision care services. Other vulnerable populations include children, Indigenous persons, and those living in rural and remote areas. Research suggests the eyesight of the general population is deteriorating and at a much younger age. Historically, myopia started at age 12 or 13, but now it is showing up in children who are six or seven years old, with almost a third of the cases going undiagnosed and uncorrected. Despite this, only 14% of children under six years of age receive professional eye care.[37]

The Indigenous community in Canada is increasing at a rate six times faster than non-Indigenous people. An increasing number of Indigenous people live with diabetes, and they are developing the disease at a much earlier age than the general population. Indigenous persons with diabetes are 25 times more likely to experience vision loss and blindness than people without diabetes. Indigenous children also have a significantly higher incidence of refractive error. Research cites a number of barriers experienced by Indigenous people that affect their use of eye health and vision care services.

People living in rural and remote areas, in particular the three territories, are also in need of eye health and vision care services. Population health data show the use of these services is lowest (27.1%) in the three territories, most likely related to the challenge of recruiting eye health and vision care providers to rural and remote communities. There is a lack of ODs in the territories and only one ophthalmologist serves all the territories. Presumably, primary eye care is largely provided by GP/FPs and NPs in these jurisdictions. In general, ophthalmologists are largely located in urban settings. ODs are more geographically dispersed in the size of communities within which they work.

Given that 75% of vision loss is preventable or treatable, one significant way to reduce the future need for eye health services and costs to the health system is to increase primary eye care. It is imperative to optimize the contributions of the eye health and vision care workforce, to use each provider most effectively. This requires alignment of complexity of eye care needs with the optimal use of skills and providers, recognizing the environments within which they work and their individual competencies. Referral patterns also play an important role in optimizing the use of primary eye care providers.

The future supply of ophthalmologists is concerning given their current age distribution, retirement numbers and lack of significant increases to postgraduate training positions over the years. Their unique skills and expertise are best used in tertiary and secondary care.

In Canada, the number of ODs is five times that of ophthalmologists, and they have a younger profile and are more widely accessible. In addition, the OD workforce is growing at three times the rate of the ophthalmologist workforce. All this suggests the role of ODs in primary care could be expanded. They are competent to provide primary eye care including screening, diagnosis and management of the four most common eye diseases affecting Canadians. When the complexity of the patient's condition increases, they consult with or refer to an ophthalmologist. This collaborative model of care management is person-centred and cost effective and should be optimized.

GP/FPs and NPs provide primary eye care as well, but with a more limited scope of practice and less often than ODs or ophthalmologists. Appropriate and timely referrals are important among all the providers along the entire continuum of eye health and vision care management.

The CAO calls for the following strategies to meet the growing eye health and vision care needs of Canadians. ›

THE CAO CALLS FOR THE FOLLOWING STRATEGIES TO MEET THE GROWING EYE HEALTH AND VISION CARE NEEDS OF CANADIANS.

1 Enhance the use of ODs for primary eye care by:

- optimizing the scope of practice of ODs across Canada to align with their education and training and national competencies
- addressing barriers to access to eye health services, particularly for children and marginalized populations

2 Use ophthalmologists as much as possible for their unique expertise and competencies in secondary and tertiary care.

3 Assess ophthalmology postgraduate capacity to ensure the future supply of ophthalmologists is adequate to meet the specialized eye care needs of Canadians.

4 Align and enhance competencies, scope of practice and education of each of the eye health and vision care provider groups with emerging technologies, pharmaceuticals and procedures.

5 Enhance interdisciplinary eye health and vision care services and appropriate use of providers by:

- developing joint national referral and consultation guidelines
- educating each provider about other eye health and vision care providers' competencies and scopes of practice
- implementing best practice and/or innovative collaborative models of care

6 Optimize the use of emerging technologies to improve:

- access to safe, appropriate eye health and vision care services
- interprofessional collaboration
- accuracy and timeliness of diagnosis and treatment
- access to eye health and vision care services in rural and remote areas

7 Promote timely access to services, especially in remote and underserved areas, by:

- implementing geographical incentives for eye health and vision care providers
- exploring innovative models of care that optimize the scope of practice of existing providers
- including rural and remote clinical placements in educational curricula

8 Launch a vision health public awareness campaign targeting the general public, as well as underserved and at-risk populations including Indigenous people, children and seniors.

9 Enhance data collection to provide pan-Canadian workforce data and address other data limitations identified in this report to support eye health and vision care HHR planning.

Appendix A Population Health Needs-Based HHR Planning

"The analytical model [22] consists of two broad elements, provider supply and provider requirements. Provider supply is the 'outcome' of two broad determinants: 1. The stock of potential providers (individuals in each age and sex group who are qualified to provide health care services) and 2. The flow of provider time from the stock, contributing to service provision. This depends on: a. the proportion of the current stock participating in the provision of health care (the participation rate), and b. the quantity of time devoted to service provision of those who do participate in the provision of health care (the activity rate).

The provider requirements are determined by four elements:

1. Demography: the size of the population being served.
2. Epidemiology: the distribution of health and illness as well as risk factors for future illness in the population.
3. Level of service: the amount and type of health care services planned to be provided for different levels of health, illness or risk of illness.
4. Productivity: the quantity of Full Time Equivalent (FTE) provider required to deliver a given level and mix of services.

Combining the first three requirement components of the framework yields an estimate of the number of health care services required by a population, given its size, demographic mix, levels and distribution of health and illness, and planned service responses to those illnesses. The fourth component (productivity) translates the number of services required into the number of health care providers required to deliver them."

Source: Birch, S, Kephart, G, Tomblin Murphy, G, O'Brien-Pallas, L, Alder, R, & MacKenzie, A. Health human resources planning and the production of health: Development of an extended analytical framework for needs-based health human resources planning. *J Public Health Management Practice.* 2009 Nov;15(6 Suppl):S56-61

Appendix B Report/Data Limitations

Data limitations pertaining to this report include:

- Pan-Canadian OD registration and workforce data.
- Standardized pan-Canadian data on types and volumes of specific eye health and vision care services provided by ODs, ophthalmologists, GP/FPs and NPs.
- Current pan-Canadian population health data on vision conditions/diseases and vision loss:
  - The latest data are five years old, from the 2012 Canadian Survey on Disabilities. In addition, the data are very limited, as they pertain only to "seeing disability," defined as persons whose daily activities are limited because of difficulties with their ability to see. A seeing disability was identified when respondents reported being limited at least sometimes, regardless of degree of difficulty. If they reported being limited rarely, they were only considered to have a seeing disability if they also indicated having a lot of difficulty or if they reported being blind or legally blind.
  - More detailed data are contained in the Participation and Activity Limitation Survey by Statistics Canada, but this was last conducted in 2006.
- Standardized, pan-Canadian wait time information for any of the providers included in this study.
- Full-time equivalent data for each of the providers, representing actual hours worked.

Appendix C Statistics Canada Population Projections

Medium Growth Scenario, 000s, Canada

	2018	2023	2028	2033	2038
ALL AGES	36,939.90	38,694.90	40,398.70	41,997.80	43,490.10
0–4	2,016.20	2,118.50	2,142.70	2,128.30	2,155.00
5–9	2,005.30	2,104.80	2,211.20	2,240.00	2,230.40
10–14	1,966.80	2,092.30	2,195.90	2,306.40	2,339.50
15–19	2,011.00	2,113.20	2,242.90	2,350.80	2,465.20
20–24	2,404.00	2,238.30	2,343.70	2,478.00	2,590.30
25–29	2,559.20	2,503.70	2,344.40	2,456.90	2,596.90
30–34	2,521.90	2,661.60	2,614.00	2,469.10	2,589.50
35–39	2,530.40	2,613.60	2,757.60	2,720.10	2,587.40
40–44	2,402.30	2,602.40	2,690.30	2,839.20	2,809.20
45–49	2,409.30	2,440.70	2,642.70	2,735.10	2,887.50
50–54	2,566.20	2,411.50	2,447.30	2,651.10	2,746.70
55–59	2,716.40	2,536.20	2,390.20	2,431.00	2,635.90
60–64	2,441.50	2,656.90	2,489.30	2,354.40	2,400.80
65–69	2,027.60	2,355.30	2,573.30	2,421.80	2,300.90
70–74	1,634.70	1,908.90	2,231.00	2,451.10	2,319.70
75–79	1,122.90	1,475.80	1,738.00	2,048.90	2,268.40
80–84	777.4	937.3	1,249.20	1,487.00	1,773.80
85–89	513.4	558.1	685.9	930	1,119.80
90–95	239.6	274.6	303.3	379.7	523.8
95–99	66.1	79.1	91.2	102.1	130
100 and over	7.7	12	14.6	17	19.2

Source: Statistics Canada, CANSIM, table 052-0005 and Catalogue no. 91-520-X.

Appendix D Overview of Provincial Health Coverage for Optometric Care, March 2017

PROVINCE	Eye Examination Coverage	
British Columbia	Routine examinations are an annual benefit of the Medical Services Plan (MSP) for patients 65 and older or age 18 and younger. All patients are covered for medically required services. The criteria for medically required services includes: ocular disease, trauma or injury, systemic diseases associated with significant risk to ocular health (e.g. diabetes), and medications that are associated with significant risk to ocular health. Optometrists may balance bill patients for services in addition to the benefit provided under MSP.	The BC Employment and Assistance Program covers the costs of routine eye examinations every two years provided by optometrists for people receiving income assistance between the ages of 19 and 64. Individuals receiving disability assistance, Persons with Persistent Multiple Barriers, Medical Services Only and people receiving Hardship Assistance who are Canadian citizens are also covered through this program. The program also covers the cost of glasses for the patient, yearly for those under 18 years of age and every 3 years for those over 18 years of age.
Alberta	Children under 19 years and adults over 65 years of age are covered for one complete eye exam, partial exam, and single diagnostic procedure per benefit year. Patients between the ages of 19–64 are covered for medically necessary conditions which can include monitoring for diabetes issues, glaucoma and retinal disease, post-operative optometric care for cataract patients, eye infections or injuries, and foreign objects in the eyes.	Human Services covers eye examinations performed by an optometrist for adults and 19 year old dependants of Income Support and AAHB recipients. The programs also covers eye glasses once every year for dependent children 19 years and younger, and every two years for adults.
Saskatchewan	Saskatchewan patients diagnosed with diabetes of any age and children under the age of 18 years are covered for an annual eye examination plus repeat and partial eye examinations. Diabetes examinations also include coverage for tonometry, OCT, and photography. Ocular urgencies and emergencies are a covered service for all SK residents.	Supplementary health benefits cover an eye exam yearly for patients under 18 years of age or older than 64 years of age. Patients between 18–64 years of age are covered every two years. Patients enrolled in the following programs are eligible: government wards, inmates of provincial correctional institutions, Senior's Income Plan, Saskatchewan Assured Income for Disability, Saskatchewan Assistance Program, transitional Employment Allowance and Provincial Training Allowance. Glasses are covered with prior approval from the ministry of health.
Manitoba	Children and youth under 19 years and adults over 64 years are insured for one exam every two-year calendar block. Patients between 19 to 64 years are no longer covered, except when medically necessary. Health coverage includes complete and partial eye examinations; full threshold visual fields; tonometry and dilated fundus exam.	Patients receiving Employment and Income Assistance are covered for an eye exam every two years. Glasses are covered every three years and lenses only if eyesight changes significantly. To receive this benefit, you must be getting EIA for at least six months.
Ontario	Patients under the age of 20 yrs. and over the age of 65 years are covered annually for an oculo-visual assessment. Patients between the ages of 19 and 65 are eligible for an insured major eye examination either through a requisition from a physician or when presenting with an eye disease or disorder that has been designated as meeting the criteria for an insured service. Insured patients are eligible for insured partial assessments when clinically necessary. An automated visual field test is an insured service for OHIP patient when clinically indicated.	The Ministry of Community and Social Services covers routine eye examinations every two years if coverage under OHIP is not available for persons receiving income support either through Ontario Works or Ontario Disability Support Program. The program assists with the cost of prescription eyeglasses once every three years for the benefit recipient, their spouse and children under 18 years of age.

Appendix D Overview of Provincial Health Coverage for Optometric Care, March 2017 (continued)

PROVINCE	Eye Examination Coverage	
Québec	Coverage is provided for ages 0–17 years and 65 years and over and includes: eye exam, tonometry/ biomicroscopy, visual field test, contact lens exam in some circumstances, etc. Dilation of a diabetic patient, or myopic patient of 5.00D and over is covered. Ocular emergency diagnosis is covered for all ages, but treatment is not. Orthoptic examinations are covered only for children 16 years of age or under.	Régie de l'assurance maladie Québec covers an eye exam every two years for persons age 18–64 who have been recipients of last-resort financial assistance for at least the past 12 consecutive months, persons age 60–64 who have been receiving a spouse's allowance under the Old Age Security Act for at least 12 consecutive months and who without this allowance would be entitled to last resort financial assistance benefits, and visually impaired persons. Ministère de l'Emploi et de la Solidarité covers the cost of eye glasses or contact lenses for patients who have been in the Social Assistance Program for at least 6 consecutive months and immediately if the patient is in the social Solidarity Program.
New Brunswick	No provincial eye health coverage.	*Healthy Smiles, Clear Vision* is the province's social development program to assist children 18 years and under of low income families. This program covers eye examination fees, lenses and glasses yearly. Patients on social assistance 19 years and older can obtain coverage for eye exams, lenses, and glasses every two years (a 30% participation fee may apply to some dispensing and diagnostic services). Patients on social assistance who are diagnosed with diabetes, glaucoma, macular degeneration or are receiving post eye surgery care can obtain coverage for eye exams yearly. Access to emergency care is available to both children and adults with one exam available every 365 days for each of 7 listed conditions.
Nova Scotia	A Comprehensive Eye Examination (CEE) for routine care is payable once in a two-year period for children under age 10 and those 65 years and older. A CEE is payable once per year for all ages in cases of clinical need, e.g. patients with health conditions (such as diabetes), or on medications, that present a risk to ocular health. Partial examinations are covered up to six times per year for the diagnosis and treatment of ocular infection, allergy or inflammation and the removal of foreign bodies from the eye. Additional coverage exists for keratoconus, low vision assessments, punctual plug insertions and lacrimal dilation and irrigation.	The Income Assistance program pays $55 towards a regular eye examination. The program also assists patients towards the cost of eye glasses every two years. The Disability Support Program covers patients for eye exams and eye glasses every two years.
Prince Edward Island	One diabetic eye exam is covered per year for patients with type 1 diabetes and every two years for patients with type 2 diabetes (retinal imaging is included, however, some co-pay may be charged for the refractive component of the examination). One partial diabetic eye exam is covered per year for patients with type 1 diabetes and one partial diabetic exam every two years for patients with type 2 diabetes. The government covers exams for red eye and dry eye. Parents of children in junior kindergarten can apply to have one eye exam co-payment reimbursement from PEI health under the Eye See Eye Learn™ program.	The Disability Support Program and the Social Assistance program provides optical benefits to patients that meet the program requirements on a case-by-case basis.
Newfoundland & Labrador	No provincial eye health coverage.	The Department of Health will contribute $55 towards the cost of a routine eye exam once every 12 months for children and once every 36 months for adults for those on income support.

Appendix E Optometric Scope of Practice Across Canada 2017

	BC	AB	SK	MB	ON	QC
DPA	Y category	Y sched 1	Y sched 1	Y sched A	Y list	Y category
TPA- **T-antiallergic**	Y category	Y sched 1	Y sched 1	Y sched A	Y list	Y category
T-NSAID	Y category	Y sched 1	Y sched 1	Y sched A	Y list	Y category
T-anti-infective	Y category	Y sched 1	Y sched 1	Y sched A	Y list	Y category
T-steroid	Y category	Y sched 1	Y sched 1	Y sched A	Y list	Y category
T-glaucoma	Y category	Y sched 1	Y sched 1	Y sched A, some co-management	Y list, POAG only	Y category; renewal or adjustment only with written or oral permission of prescribing ophthalmologist
T-immunomodulators	N	N	N	N	Y list	N
O-antiallergic	N	Y sched 1	Y sched 1	N	Y OTC only	N
O-NSAID	N	Y sched 1	Y sched 1	N	N	N
O-anti-infective	N	Y sched 1	Y sched 1	Y some co-management	Y list, up to 14 days	N
O-steroid	N	Y sched 1	Y sched 1		N	N
O-glaucoma	Emergency ACG only	Y sched 1	Y sched 1	Emergency ACG only	Emergency ACG only	N
FB removal	Y	Y	Y	Y	Y	Y
Laboratory testing	N	Y	N	Y orbital x-ray, surface culture	N	N
Ultrasound imaging	To measure corneal thickness	Y	To measure corneal thickness	To measure corneal thickness	To measure corneal thickness	To measure corneal thickness
Dilation/Irrigation	Y	Y	Y	Y	Y	Y
Insertion/removal punctual plugs	Y	Y	Y	Y	Y	Y
Injection	N	N	N	N	N	N
Lasers	N	N	N	N	N	N

LEGEND

T	topical
O	oral
Y	yes
N	no

LIST OF ACRONYMS

DPA	Diagnostic Pharmaceutical Agent
TPA	Therapeutic Pharmaceutical Agent
NSAID	Non-Steroidal Anti-Inflammatory Drug
ACG	Acute Angle Closure Glaucoma
POAG	Primary Open Angle Glaucoma
OTC	Over the Counter

Appendix E Optometric Scope of Practice Across Canada 2017 (continued)

	NB	NS	NL	PEI	Yukon
DPA	Y category	Y category	Y category	Y category	Y category
TPA-T-antiallergic	Y category	Y category	Y category	Y category	Y category
T-NSAID	Y category	Y category	Y category	Y category	Y category
T-anti-infective	Y category	Y category, not for ulceration	Y category, not for ulceration	Y category	Y category
T-steroid	Y category	Y category, not for ulceration, less than 4wks duration	Y category, not for ulceration	Y category (includes Immunosuppressive)	Y category
T-glaucoma	Y category emergency ACG only	N	N	N	Y category, in co-management with ophthalmology only
T-immunomodulators	N	N	N	N	N
O-antiallergic	N	N	N	N	N
O-NSAID	N	N	N	N	N
O-anti-infective	N	N	N	N	N
O-steroid	N	N	N	N	Y category, in co-management with ophthalmology only
O-glaucoma	Emergency ACG only	N	N	N	Y category, in co-management with ophthalmology only
FB removal	Y	Y	Y	Y	Y
Laboratory testing	N	N	N	N	N
Ultrasound imaging	To measure corneal thickness	To measure corneal thickness	To measure corneal thickness	To measure corneal thickness	To measure corneal thickness
Dilation/Irrigation	Y	Y	Y	Y	Y
Insertion/removal punctual plugs	Y	Y	Y	Y	Y
Injection	N	N	N	N	N
Lasers	N	N	N	N	N

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