



CANADIAN ASSOCIATION OF OPTOMETRISTS  
ASSOCIATION CANADIENNE DES OPTOMÉTRISTES

OPTOMETRY'S FUTURE

## ECONOMIC VALUE OF PRIMARY CARE PREVENTION SERVICES PROVIDED BY DOCTORS OF OPTOMETRY

A LITERATURE REVIEW COMMISSIONED BY  
CANADIAN ASSOCIATION OF OPTOMETRISTS

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## Introduction

Canada is a signatory to the World Health Organization's Vision 2020 Global Declaration, "Vision 2020: the Right to Sight", an international initiative to combat avoidable blindness. The WHO Vision 2020 report recommends three methods for improving international eye care: disease prevention and control, human resource development, and infrastructure and technology.<sup>1</sup>

According to WHO "Unless additional eye-care services are provided, the number of people suffering from vision loss due to chronic age-related eye diseases will rise as a result of increased life expectancy and population growth. In order to prevent avoidable visual impairment at the community level, it is necessary for primary eye-care services to be strengthened."

Primary health-care and community-based interventions are essential for preventing blindness and visual impairment. According to WHO, "[d]eveloping and implementing national policies and plans for the prevention of avoidable visual impairment remain the cornerstone of strategic action."<sup>2</sup>

## Purpose

To conduct a literature (peer-reviewed and grey, English only) review of the cost benefit/economic value of primary care prevention services offered by Doctors of Optometry, namely comprehensive eye exams.

## Methodology

The literature search consisted of four strategies:

1. Search of peer reviewed literature using OVID of MEDLINE full text, Cochrane Database of Systematic Reviews, NHS Economic Evaluation Database, and Database of Abstracts of Reviews of Effects, from 2005-2015. The subject heading used included the following terms:

- Value of vision care
- Value of preventative eye care
- Value of optometrists
- Preventative eye exams
- Preventative vision care
- Optometry services
- Vision prevention
- Cost of vision loss

This resulted in 43 articles dating from 2005 to 2015, which were reviewed for relevancy, arriving at a final eight articles for inclusion.

2. Specific search of the Canadian Journal of Ophthalmology and the Journal of the American Optometric Association with no date specification was undertaken for the terms 'comprehensive eye exam' and 'vision prevention'. This resulted in 248 abstracts, which were reviewed for relevancy, resulting in 13 final articles for inclusion.
3. Review of a selection of grey literature provided by the Canadian Association of Optometry.
4. Additional sources were also identified via citations offered in reference sections of relevant articles and documents.

## Findings



The literature review resulted in the emergence of five interrelated and sometimes overlapping concepts. Each of these concepts is described below.

### Importance of Vision Health

Vision loss is the most feared disability for Canadians (69%)<sup>3</sup> Canadians value their vision and believe maintaining their eye health is important. In a recent public opinion poll, when asked about the relative importance of different aspects of one's overall health, Canadians rank maintaining vision health and preventing vision loss third, following heart health and weight management.<sup>4</sup>

Among the four major vision-threatening eye diseases, the overwhelming majority of Canadians have heard of cataracts (90%) and glaucoma (86%). However, only 60% have heard of age-related macular degeneration (AMD), the leading cause of vision loss among seniors, and only 32% have heard of diabetic retinopathy, the leading cause of vision loss among Canadians under 50. Five per cent indicated they had not heard of any of the diseases listed.<sup>5</sup>

Twenty-six per cent of Canadians (an estimated nine million people) report experiencing this degree of impairment. However, among them, less than half (42%) say they have been recommended to see a specialist to discuss vision loss.<sup>6</sup>

When asked how important different types of actions and behaviours are to one's vision

health, Canadians strongly endorsed the importance regular eye examinations (96%).<sup>7</sup> Current Canadian Association of Optometrists (CAO) guidelines indicate healthy Canadian adults should undergo an examination to check the health of their eyes at least every two years. Seventy-six per cent of Canadians in general indicate they have met this guideline. Interestingly, the lowest compliance (54%) is among Canadians who do not wear glasses or prescription lenses, indicating that Canadians may not be recognizing the link between eye exams and eye health as much as they need to.<sup>8</sup> Among Canadians with diabetes, who are recommended to have annual exams to monitor for eye disease directly related to diabetes, 88% report having an exam in the last two years. Compliance is lower among Canadians aged 18-34 (64%), as well as First Nations people (68%) and smokers (69%), despite the fact both these groups have an increased risk of eye disease.<sup>9</sup>

### Prevalence and Burden of Vision Loss

The prevalence of low vision and blindness in Canada is on par with other developed countries, with older age significantly associated with low vision and blindness. A 2006 Canadian study found a prevalence of low vision and blindness was 35.6 and 3.8 per 10000 individuals according to the World Health Organization (WHO) classification, and 71.2 and 23.6 per 10 000 individuals, using the North American definition. 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.<sup>10</sup>

Using the North 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.<sup>11</sup>

More than four million Canadian adults have one of the leading ocular diseases - all of which are

age related.<sup>12</sup> Within the next 20 years the number of Canadians with vision loss is expected to double.<sup>13</sup> This is in large part due to an aging population. Canadians in the greater than age 64 population will double from 4.6 million in 2010 to 9.2 million by 2031 representing approximately 24% of the population.<sup>14</sup> After age 40, the number of cases of vision loss doubles approximately every decade. At 75, it triples.<sup>15</sup>

Diabetic retinopathy (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. It is, however, a largely preventable cause of vision loss that can be controlled through cost-effective interventions.<sup>16</sup>

Some British studies have suggested that 5% to 10% of diabetic patients have sight-threatening retinopathy, with up to 40% of these patients having some degree of retinopathy at diagnosis. Current management strategies emphasize screening and risk-factor reduction.<sup>17</sup>

The vast majority of eye problems are asymptomatic and thus are 'silent'.<sup>18</sup> According to an Optometry Incident Reporting Analysis from December 2011 to June 2015, 77% of incidents reported existed in asymptomatic patients. This suggests the underlying value of frequent eye examinations. However, 27% of patients wait more than 5 years between comprehensive eye examinations. An additional 39% of patients wait between 2 and 5 years between examinations. Thirty one percent of Optometrists indicated their patients previously had a sight test but did not understand the difference between a sight test and an eye exam.<sup>19</sup>

### *Seniors and Vision Loss*

Vision loss prevents healthy and independent aging; it is associated with a number of other

illnesses such as increased morbidity and an increased risk of falls.<sup>20,21</sup> Poor visual acuity has been shown to approximately double an individual's risk of falling, and poor vision may be responsible for 25% to 50% of all falls in the visually impaired.<sup>22</sup> Research has also shown how vision impairment compromises quality of life and limits social interaction and independence. Vision impairment caused by AMD has also been shown to interfere with the person's ability to care for themselves and others indicating need for community and vision related support. Vision loss from AMD has been shown to be associated with depression.<sup>23</sup>

A Canada wide study of sample of seniors from community- and institution-dwellings, found that visual impairment in elderly Canadians is common and is associated with increased odds of institutionalization, frequent falls, difficulty with everyday activities, and poor health. Good eyesight may imply good health and good independence in the elderly.<sup>24</sup>

Ivers et al found that subjects with visual acuity less than 20/60 were 1.5 times more likely to suffer a hip fracture than those who had good vision. This relative risk increased to 2.4 when the visual acuity worsened to less than 20/100.<sup>25</sup> Furthermore, another study found that 15% of hip fractures in older adults were associated with a visual impairment.<sup>26</sup>

According to one study, falls contribute to 40% of admissions in care homes. In addition, about 60% of people living in care home have recurrent falls yearly, attributable in part to visual impairment where its prevalence is higher in nursing homes.<sup>27</sup>

Almost one-third of those with vision loss suffer from clinical depression – twice the rate among the general population of older adults. Additionally, older people who suffer from vision loss are more likely to struggle with mobility, pain and discomfort and anxiety. Vision loss not only severely impairs one's ability to be independent and self-sufficient, but it also has a

“snowball effect” on the health and wellbeing of older people, families, caregivers, and society at large. This cumulative effect is considered to be severely underestimated.<sup>28</sup>

People whose vision impairment resulted in blindness are more than 1.5 times as likely to experience depression or injury, and they are nearly three times as likely to need skilled nursing and long-term care facilities.<sup>29</sup>

According to a summary of research compiled by the National Coalition for Vision Health<sup>30</sup>, vision loss:

- Doubles the difficulties of daily living.
- Nursing home admissions occur 3 years earlier.
- Doubles social dependence.
- Doubles the risks of falls.
- Triples the risk of depression.
- Quadruples the risk of hip fractures.
- Doubles mortality rate.

Primary eye care services can make a difference. The Manitoban Focus on Fall Prevention Project developed in 2006 was designed to compensate for the lack of visual care and services in long term care facilities with a goal of reducing falls and fractures. Featured services included vision screening and on-site optometry services, among others. During the first year, 50% of those residents screened were referred for some form of vision intervention. Minor injuries associated with a fall decreased from 72 to 52; major injuries decreased from 19 to 10. A reduction of falls by as high as 76% was experienced in one institution during implementation of the program.<sup>31</sup>

## Cost of Vision Loss

The cost of vision loss is staggering. It has the highest direct health care costs of any other disease. According to AMD Alliance International, the direct costs of vision loss worldwide in 2010 were \$2.3 trillion.<sup>32</sup> Indirect costs, such as lost productivity and provision of

informal and family care, added another \$652 billion. By 2020, these costs are expected to rise to \$2.8 trillion for direct costs and \$760 billion for indirect costs to families, caregivers, and society at large.

A report commissioned for the CNIB and the Canadian Ophthalmological Society found the financial cost of vision loss in Canada to be estimated at \$15.8 billion in 2007 – 1.19% of Canada’s GDP.<sup>33</sup> This breaks down to \$500 for every Canadian or \$19,370 for every Canadian with vision loss in 2007. The total cost is comprised of two components:

- indirect costs of vision loss estimated at \$7.2 billion
- direct (health-related) costs are \$8.6 billion.

The net cost of suffering (also known as the burden of disease) due to vision loss, over and above financial costs, was estimated to be a further \$11.7 billion in 2007 with the break down as follows:

- individuals with vision loss (\$3.5 billion);
- family/friends (\$474 million);
- federal government (\$2.4 billion);
- provincial/territorial governments (\$6.3 billion);
- employers (\$141 million); and
- society/other (\$3.0 billion).

In the next 25 years, the number of Canadians with vision loss is projected to double. The number affected will top one million in the next five years and continue escalating. Based on current projections, the financial expenditures associated with vision loss would cost Canadians \$30.3 billion by 2032 (in 2007 dollars).<sup>34</sup>

A 2012 update to this study by Deloitte Access Economics, has found the new total cost of vision loss to Canada’s economy to now be an estimated \$19.1 billion. Within this, indirect costs are estimated at \$8.1 billion, while direct health system costs are \$11 billion.<sup>35</sup>

In comparing results from this study with Public

Health Agency of Canada data, vision loss accounts for a large proportion – approximately 8% – of the economic burden of illness in Canada. Vision loss has the highest health care costs (direct costs) of any disease category in Canada – much more than diabetes, cancer, mental disorders, respiratory diseases, arthritis or cardiovascular disease. When compared to other diseases, vision loss is also a huge financial burden, largely due to the high cost of lost productivity to the Canadian economy. In total financial costs (direct and indirect), vision loss ranks fourth compared to all other disease categories, ahead of diabetes, respiratory diseases and mental disorders.<sup>36</sup>

These costs are comparable with that of other countries. For example, the total economic cost of vision loss in Australia is estimated to be \$16.6 billion in 2009 or \$28,905 per person with vision loss aged over 40.<sup>37</sup> This is made up of:

- Total health system costs of \$2.98 billion
- Total other financial cost of vision loss of \$4.2 billion or \$7,373 per person aged over 40 with vision loss including \$2.28 billion in estimated productivity losses of those with vision loss
- \$869 million in estimated deadweight losses from transfers and lost taxation
- \$839 million in estimated other indirect costs (aids, modifications, other carer and bring forward of funeral expenses)
- \$251 million in estimated carer (opportunity) costs

According to the Royal National Institute of Blind People, the economic costs of partial sight and blindness on the United Kingdom total [pounds] 22 billion, with direct healthcare costs amounting to [pounds] 2.14 billion. This was based on estimates of a total of 1.8 million people with partial sight and blindness in the UK adult population in 2008, with 3.5% from diabetic retinopathy.<sup>38</sup>

There are several economic vision loss studies from the United States. Frick et al. found that among adults older than 40 years who have

visual disorders, visual impairment, and blindness, the aggregate annual economic impact included \$5.5 billion spent for medical care and the value of informal care as well as a loss of more than 209 000 quality-adjusted life years.<sup>39</sup> Another study found the financial burden of visual impairment and blindness in the United States to be estimated at \$51 billion.<sup>40</sup> In 2006, Rein et al estimated the societal economic burden and the governmental budgetary impact of the following visual disorders among US adults aged 40 years and older: visual impairment, blindness, refractive error, age-related macular degeneration, cataracts, diabetic retinopathy, and primary open-angle glaucoma. They estimated the annual total financial burden of major adult visual disorders to be \$35.4 billion (\$16.2 billion in direct medical costs, \$11.1 billion in other direct costs, and \$8 billion in productivity losses) and an annual governmental budgetary impact of \$13.7 billion.<sup>41</sup>

In 2008, the National Eye Institute estimated the economic costs of visual disorders and disabilities at \$68 billion using both medical expenditures and indirect costs of lost productivity and institutionalization.<sup>42</sup> The Healthy People 2010 Progress Review (2008) stated that the lifetime costs associated with visual impairment are estimated as \$601,000 per person in 2003 dollars.<sup>43</sup>

A comprehensive analysis conducted by Prevent Blindness America (PBA) found that total economic impact of adult vision problems, including cataract, diabetic retinopathy, glaucoma, refractive error, visual impairment and blindness, totaled over \$51 billion.<sup>44</sup> This was based on \$16.2 billion in direct medical costs, \$11.2 billion in other direct costs, \$8 billion in productivity losses, \$5.5 billion in total excess monetary impact, and \$10.5 billion in health-related quality of life costs.<sup>45</sup>

Several other studies speak to various components or aspects of the costs of vision loss, both direct and indirect, including the

burden of illness. Javitt et al.<sup>46</sup> showed, in a Medicare population, that when vision decreases, the costs for depression, injury, skilled nursing facilities (SNFs), nursing homes and other costs all rise. Thus, improvement in vision or prevention of vision loss can save dollars that would otherwise be spent on depression, injury, SNFs, nursing homes, etc.

Schmier et al.<sup>47</sup> studied the caregiver costs associated with vision loss. In their analysis, they found that 72.3% of caregiver costs were unpaid, either given by spouses, other family members or friends. Nonetheless, these are still considered as costs because those who give free care would otherwise be able to enter the paid job market. The time spent on free caregiving was costed at the national hourly wage level. The authors found that yearly caregiver costs began to rise dramatically when the vision decreased to the 20/80 level or worse in the better-seeing eye and when it reached 20/250 or worse in the better seeing eye, inflation-adjusted caregiver costs amounted to US\$58 000 per year. Another study has estimated the indirect costs due to caregivers' time, support, and direct service provision for people with severe visual impairment averages over \$47,000 per year.<sup>48</sup>

In another study, patients with NV-AMD reported substantially worse vision-related functioning and overall well-being, including higher depression scores, than controls after adjusting for age, gender and co-morbidities. Significantly more patients reported a need for assistance with daily activities and more falls compared with controls. Total annual healthcare utilization costs were more than sevenfold higher for patients with AMD compared with controls.<sup>49</sup>

The cost of vision loss is also high because of lost productivity in the workforce. Higher absenteeism, premature retirement, and premature death are all more common outcomes among those with vision loss. In the United States and Canada, the cost of absenteeism due to visual impairment in 2010

was estimated to be nearly \$97 billion.<sup>50</sup> According to AMD Alliance International estimates, the economies of the region anchored by the United States and Canada lost nearly \$97 billion in 2010 due to absenteeism caused by visual impairment.<sup>51</sup>

People with vision loss have lower employment rates compared to those with physical or mental limitations. They also receive decreased salary compared to a person who has no disabilities. The average person with mild bilateral vision loss has a 43.9% incidence of employment, versus 34% for a person with severe bilateral vision loss and 79.1% for an age-matched person with no disability.<sup>52</sup> "The median monthly salary for a person with mild vision loss is US\$2207 and that for severe vision loss is US\$2564, versus US\$2724 for an age-matched person with no disability. Overall, the average person with mild vision loss with mild vision loss makes 45% that of the age-matched working person with no disability, whereas the average person with severe vision loss makes only 40.5% that of the average age-matched person with no disability."<sup>53</sup> The cost to the United States' gross domestic product (GDP) due to AMD in 2004 was estimated to be \$1.6 billion as a result of unemployment and \$1.2 billion to lower wages – or a total loss of more than \$2.8 billion.<sup>54</sup>

Similar differences are found here in Canada. According to Statistics Canada, people living with vision impairment or loss had an unemployment rate of 19.1% in 2001 and 13.0% in 2006. In comparison, people without any disabilities experienced an unemployment rate of 7.1% in 2001 and 6.2% in 2006.<sup>55</sup>



## Cost Benefit of Primary Eye Care



### General

Vision correction is one of the most cost-effective interventions in human and economic development, considered equal to immunizations by the World Health Organization in both importance and impact.<sup>56</sup> Seventy five percent of vision loss is avoidable - preventable or treatable.<sup>57</sup> Millions of dollars could be saved annually if avoidable vision loss was prevented. A return of close to \$5 for every dollar invested can be achieved.<sup>58</sup> It is important that indirect costs be in the equation when evaluating the cost-benefit of vision-loss prevention programs.

The cost effectiveness of primary eye care in the form of vision screening and comprehensive eye exams has been demonstrated. A 2006 study using data from Medicare beneficiaries underscores the value of screening and then treating eye disease soon after diagnosis. Looking at four diseases – AMD, cataracts, DR, and glaucoma. Results showed that 70 percent of the costs incurred during the first year after an initial diagnosis equated to the total cost for the five-year period examined.<sup>59</sup>

A 2004 Australian study calculated both direct and indirect costs and compared them to the cost of an intervention program designed to reduce preventable blindness and vision loss through early detection, prevention, rehabilitation services, education, and research. The study found a return on investment of

nearly five times during the first year and more than six times over a lifetime of intervention.<sup>60</sup>

Although the results are not universal, research has shown that yearly dilated eye examination for diabetic retinopathy among those with type 1 diabetes has a clear cost benefit.<sup>61</sup> In Canada, an intervention is considered cost-effective if it costs less than \$40,000 per quality of life year (QALY). Screening and treatment of diabetic retinopathy costs \$3,190 per QALY. Screening in remote First Nations communities costs \$11,000 per QALY.<sup>62</sup>

An Ontario study found the four most prevalent eye conditions – AMD, open-angle glaucoma, diabetic retinopathy and cataracts – cost Ontario \$1.81 billion annually in direct health care costs. If they prevented 20% of Ontarians with AMD from progressing to wet AMD (the advanced form of this disease), they could avoid \$235.3 million in direct health costs. In addition, in 2013/14, there were 104,319 Emergency department visits in Ontario for eye conditions that could have been treated more cost-effectively by an optometrist, which cost the health system \$17.5 million. These two interventions alone would avoid spending of \$252.9 million annually in health care, which could be reinvested.<sup>63</sup>

### Comprehensive Eye Exams in Children

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 Grades K-6. The incidence of vision problems is much higher in children at risk; Aboriginal children have a significant higher incidence of refractive error.<sup>64</sup>

Sixty percent of children labeled as having learning problems have vision problems.<sup>65</sup> Eighty percent of all learning during a child's first 12 years is visual.<sup>66</sup> Visual deficiencies impair reading acquisition and learning and influence other behavior.<sup>67</sup> 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 (VIL) 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".<sup>68</sup> Visual impairment in children is associated with developmental delays and the need for special education, vocational and social services, often beyond childhood into adulthood. Despite this, only 14% of Canadian children under six years of age receive professional eye care.<sup>69</sup>

Early detection and treatment is essential in treating eye disorders in children. The American Public Health Association (2002) recommends "a regular comprehensive eye examination schedule as opposed to just screening...so that all children have exams performed at approximately age 6 months, 2 years, and 4 years." The American Optometric Association states that "all children should receive a comprehensive eye and vision examination assessing and treating any deficiencies in ocular health, visual acuity, refractive status, oculomotility and binocular vision prior to entering school." The evidence shows that comprehensive eye exams for children by an optometrist or ophthalmologist are highly effective in detecting vision conditions.<sup>70</sup>

Several studies highlight the importance of vision and the elimination of vision problems as essential to children's performance in school. The New Jersey Commission on Business Efficiency of the Public Schools documented the savings in special education and other costs that would accrue if early intervention for children with undiagnosed or untreated vision problems, and early reading assistance and follow-up were implemented. "Not including local costs, if they had provided these children with appropriate early intervention reading assistance, the savings would be two fold: 1) \$200 million dollars per

year in special education aid costs, and 2) the rescued lives of thousands of children each year. Per grade level, the savings would be approximately \$20 million. Applying this savings estimate to grade levels K-2 would generate \$50 million by the end of the sixth year. Annual savings would then increase each year as these children avoid classification until it reached approximately \$200 million per year. The total cost per year would be \$22 million including local share. An initial program costing \$22 Million could yield cumulative savings of more than one half \$Billon within ten years."<sup>71</sup>

Vision screening programs provided in schools have been used to try to identify children with vision problems who previously have not had access to an eye and vision examination. Several studies suggest that vision screening programs vary significantly and often fail to provide the desired result, generally only including a screening of visual acuity and gross ocular alignment. These programs can create a false sense of security for those children who "pass" the screening, but who actually have a vision problem.<sup>72</sup> Swanson et al suggest that vision screening programs and pre-school physical examinations are not a substitute for a professional eye examination. A comprehensive vision examination is the only way to achieve early diagnosis and prevent years of needless suffering and failure for children. Comprehensive assessment programs, as compared to current screening methods, are highly sensitive and prudent fiscally and with respect to health and education outcomes.<sup>73,74</sup>

Given the concern about the costs of a comprehensive eye examination versus vision screening, Abt Associates conducted a study to determine the relative costs of universal screening versus universal eye examinations before entering school. The study found that a universal preschool eye examination would be more cost effective in diagnosing and treating amblyopia, the most prevalent childhood eye condition, than a universal screening program before entering school. Replacing a system of

“usual care” with universal preschool eye exams was found to be highly cost effective at a cost of \$12,985 per QALY. Universal eye exams were also highly cost effective when compared to universal vision screenings at cost of \$18,390 per QALY.<sup>75</sup>

A recent survey commissioned by the Canadian Association of Optometrists 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.<sup>76</sup>

## Role of OD



The International Diabetes Federation guidelines state that, “at a minimum, all people with diabetes should have annual direct funduscopy and an examination of visual acuity by a trained provider, with more frequent screening for those with existing disease affecting vision or pregnancy. Specialist training to detect the presence of DR is important, as the sensitivity of a primary provider with a standard ophthalmoscope is only 50%.”<sup>77</sup>

Optometry was named in an Institutes of Medicine (IOM) report in 1996 as one of several professions that is able to deliver important primary care health services. Optometrists have the technology and education required to

deliver a thorough eye exam. However, a nationwide on-line survey reveals that when faced with an eye emergency such as an eye infection, an eye injury or foreign body in the eye, 80% said did not know they could contact a Doctor of Optometry, even though it could give them access to prompt, specialized care.<sup>78</sup>

“According to the Canadian Institute for Health Research, more than 36,600 Canadians visited an emergency department in 2013/2014 seeking treatment for a common eye condition called conjunctivitis – also known as pink eye. Pink eye, which affects the surface of the eyeball and the inside of the eyelid, is the most common eye infection among children. It is also one of the top 10 causes of avoidable emergency department (ER) visits in Canada. With average national ER wait times of more than four hours, patients are spending significant time waiting for care that can be promptly delivered by visiting their Doctor of Optometry. Patients visiting an optometrist for an urgent eye issue also benefit from the availability of specialized equipment allowing the optometrist to examine the exterior and interior of the eye. Most uncomplicated eye conditions can be resolved with the proper diagnosis and treatment. However, misdiagnosis of an eye infection or injury can have significant consequences, mainly from delaying treatment.”<sup>79</sup>

An analysis that assessed the cost-effectiveness of funding optometrists for diabetic eye care versus funding general practitioners (GPs) for such services in Prince Edward Island found that biannual screening and treatment of DR by optometrists was determined as a cost-saving strategy compared to GP delivered service. The model was most sensitive to the health utility of diabetic patients, and screening rates provided by GPs. Varying the discount rate from 0 to 5% had the least impact on the cost-effectiveness of screening results. In other screening scenarios (annual and biennial), services provided by optometrists appeared to be very cost-effective, or even cost-savings compared to services delivered by GPs. The estimated potential

financial savings to PEI government could be between C\$ 45,000 to C\$390,000 during 1 year to 10-year horizon if optometric services were publicly funded.<sup>80</sup>

An Ontario study found that 72,745 ophthalmology consultations cost the health system \$6 million. Even if optometry's OHIP assessment fees were adjusted to match the actual costs of care, optometrists could provide 85,124 assessments – or 12,379 more – for the same \$6 million expenditure.<sup>81</sup> A lack of government-funded optometric services in various Canadian provinces/territories is associated with a 5% reduction in utilization of eye care providers and a 5% increased utilization of family doctors.<sup>82</sup>

A similar study in Florida has determined the cost savings of Doctors of Optometry use of oral medications for potential treatment in primary eye care practices.<sup>83</sup> The study found that visits to "other providers" (ophthalmologists) had Medicaid payment estimates of \$89M, primarily for conditions treatable by Doctors of Optometry. The potential annual Medicaid savings for primary eye care conditions potentially treated with oral medications prescribed by a OD ranged from \$20M in direct referral reduction to as high as \$90M in total.

Optometrists are also playing a role in identifying other chronic conditions. The eyes are the only part of the human body that provide a non-invasive view of blood vessels and nerve tissue, providing valuable information about an individual's overall health. Alterations in retinal blood vessels allow the clinician to draw conclusions about the status of blood vessels in the entire body. Changes in the eye often precede or occur concurrently with various systemic conditions and can represent important prognostic indications of disease progression. A comprehensive eye examination presents a unique opportunity to detect and monitor the impact chronic diseases/conditions such as diabetes, hypertension and high cholesterol

have on the body and the eyes. It is an important component in the evaluation of an individual's overall health status.

For example, a 2007 survey by American Optometric Association of their members found that more than three quarters (78.5%) of the respondents reported seeing 1 or more patients who suffered from neurologic insult over the 12 months before the survey and providing treatment to more than half of those patients.<sup>84</sup> Another study showcases examples of optometrist's role in the management of hypertensive crises.<sup>85</sup>

A study conducted by Optum, on behalf of United Healthcare, illustrates the role of eye care practitioners (ECPs) in identifying chronic diseases through comprehensive eye exams.<sup>86</sup> The study investigated eight chronic conditions and evaluates the frequency with which an ECP was responsible or directly contributed to the identification of the disease. Multiple sclerosis, diabetes, juvenile rheumatoid arthritis and Crohn's disease had the highest percentage of identification by ECPs. More than 4,000 cases of chronic conditions were identified by an ECP. Over 2,600 members had at least one chronic condition identified by an ECP. On average, members were diagnosed 15 days following a comprehensive eye exam. Diabetes, high cholesterol and hypertension were the most prevalent conditions identified by ECPs. These findings are corroborated by other studies which found that optometrists can detect early warning signs of conditions such as hypertension<sup>87</sup>, high cholesterol<sup>88</sup>, and vascular disease<sup>89</sup>.

A lack of awareness of the full range of services provided by optometrists leads primary eye care to be often inappropriately and expensively delivered in hospital emergency departments, and by family physicians and ophthalmologists.

## Conclusion

Vision health is very important to Canadians with vision loss being their most feared disability.

Canada is facing a vision loss crisis as the population ages and age related eye disease (skyrockets. Vision correction is recognized by the World Health Organization as one of the most cost-effective interventions in human and economic development, considered equal to immunizations in both importance and impact. Eye health is an important component of overall health, and is linked to falls, depression and other conditions in seniors. Vision loss has the highest health care costs (direct costs) of any disease category in Canada. The economic burden – both direct and indirect costs - is already significant and will be staggering in the next decade.

Given that 75% of vision loss is preventable or

treatable, primary eye care, including prevention, is key. Research shows the cost benefit of comprehensive eye exams in the early detection of vision problems. Research also shows that primary eye care provided by optometrists, as contrasted with family physicians or ophthalmologists, is both cost effective and an efficient use of health resources. Doctors of optometry have been shown to be a key member of the primary care health team; beyond providing comprehensive eye care, they have been shown to identify other chronic conditions such as Crohn's disease, diabetes, hypertension and others during comprehensive eye exams in adults. Integrated eye care is a way to improve overall health as well as eye health.

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