



# CAO Position Statement on Myopia Management

## Background

Myopia is one of the leading causes of blindness in the world.<sup>1</sup> The most common refractive error, myopia occurs when there is a mismatch between the axial length and the refractive components of the eye and can be defined as a spherical equivalent refractive error of -0.50D or more.<sup>2</sup> Myopia is characterized by excessive eye elongation or excessive corneal curvature, with a risk of sight-threatening complications.<sup>3</sup>

The prevalence of myopia is increasing worldwide, and without effective intervention the prediction is that by 2050 the global prevalence of myopia will be 50% (compared to 28% in 2010).<sup>4</sup> The onset of myopia is also occurring at an earlier age.<sup>5</sup> As myopia continues to progress typically through to late teens<sup>6</sup>, this earlier onset will naturally lead to an increased risk of high myopia<sup>7,8</sup>, with the predicted prevalence of high myopia being 10% of the world's population by 2050.<sup>4</sup> Canadian data from a pilot study in 2018 demonstrated a prevalence of myopia of 29% in children aged 11-13.<sup>9</sup>

## Issue

That myopia is considered as merely an inconvenience of uncorrected vision, **rather than a global public health issue.**

## Risks associated with myopia

There is no “safe” level of myopia, given that all levels of myopia have an accompanying increased risk of eye disease.<sup>3</sup> These diseases include cataract, open angle glaucoma, retinal detachment, and myopic maculopathy. Myopic maculopathy is a leading cause of visual impairment worldwide, with a 40x increased risk in individuals with myopia of -6.00D or more.<sup>3</sup> The global prevalence of visual impairment (including blindness) caused by myopic maculopathy is predicted to increase from 10 million people in 2015 to 55.7 million in 2050, with an associated increase in the number of people who are legally blind from 3.3 million to 18.5 million in the same period.<sup>10</sup>

The increased visual impairment that can result from myopia, and in particular high myopia, has been identified by the World Health Organization as a significant public health concern.<sup>11</sup>

## Risk factors for development of myopia

There is clear evidence of a variety of risk factors that lead to myopia and subsequently high myopia. These risk factors include, but are not limited to:

- **Family History:** a family history of myopia is a significant risk factor.<sup>12</sup> A child with one or two myopic parents has a greater chance of being myopic than one with no family history of myopia.<sup>13</sup> There is also a “dose relationship” between the extent of parental myopia and the corresponding myopia in their children: Children who have highly myopic parents are more likely themselves to have high myopia.<sup>14</sup>

- **Outdoor time:** There is clear evidence that spending time outdoors can delay the onset of myopia, with even an extra hour per week of outside time having a positive impact on disease progression.<sup>9, 15, 16</sup>
- **Presenting refractive error:** Children who present with less hyperopia than expected for their age (for example  $\leq +0.75D$  at 6 years of age), are at a higher risk of developing myopia.<sup>6</sup>
- **Ethnicity:** Independent of location, East Asian children have a higher likelihood of being myopic compared to children from other ethnic backgrounds.<sup>17,18</sup> Environmental factors can also influence myopia prevalence.<sup>19</sup>
- Additional risk factors include increased near work, and increased screen time.<sup>20-22</sup>

## Impact of myopic eye disease

Vision impairment and blindness has a far-reaching impact on the individuals affected, their family members and caregivers, with a resultant cost burden. In Canada, vision disorders have been ranked eighth among diseases in terms of economic burden on the health care system, ahead of such things as , endocrine diseases, Neoplasms, infectious diseases, and diseases of the blood.<sup>23</sup> In 2019, the direct cost of vision loss to the Canadian health care system was estimated at \$9.5 billion.<sup>24</sup>

People with significant vision impairment are less likely to actively participate in society. This can have an impact on education, employment, mental health, and functional capacity. There is a reduced functional status in daily life and quality of life of individuals with pathologic myopia.<sup>25</sup>

## Myopia management

The term myopia management (often used synonymously with myopia control) refers to the prescribing of an intervention to slow down the progression of myopia.

Slowing down the progression has short- and long-term impacts. In the short-term, an individual with a lower refractive error will have better uncorrected acuity. In the longer term, slowing down progression may reduce the chance of ocular disease and subsequent vision impairment. A reduction of even 1 dioptre can have a significant impact on risk, reducing the risk of myopic maculopathy by 58%, retinal detachment by 30% and open angle glaucoma by 20%.<sup>26</sup>

Myopia management starts before the onset of a myopic refractive error, with the assessment of risks and provision of education to patients and parents on ways to mitigate that risk, for example spending more time outside and less time on prolonged near vision. Once an individual demonstrates a myopic refractive error or is deemed at risk of developing myopia, the discussion around the introduction of a myopia management strategy should be considered.

## Options for myopia management

There is compelling evidence in the scientific literature that myopia management measures can, and do, have an effect on the rate of progression of axial length and refractive error in myopic patients.<sup>27,28</sup>

There are many proven options available for myopia management,<sup>27,29</sup> broadly falling into three categories:

- Specialized spectacles;
- Specialized contact lenses;
- Pharmaceutical agents.

There are various considerations for making decisions on a treatment strategy, including but not limited to the age/maturity of the patient, presenting refractive error and availability of treatment options, as well as taking into consideration the expertise and experience of the optometrist and the equipment available to support the chosen treatment.

## Myopia management as a standard of care

The World Council of Optometry (2021) has produced a resolution for myopia management standard of care, citing three main components:

- **Mitigation** (education of parents and children on factors to delay the onset of myopia)
- **Measurement** (evaluation of the status of patients during eye examinations)
- **Management** (correction of myopia and provision of evidence-based interventions to slow down the progression of myopia).

## Policy position

The Canadian Association of Optometrists (CAO) recognizes that myopia, and in particular high myopia, is a global public health issue and cannot be considered merely an inconvenience of uncorrected vision.

The CAO recommends that individuals of all ages receive routine eye examinations and endorses the evidence-based guidelines for the frequency of comprehensive eye examinations.

The CAO recommends that when Optometrists examine patients, they should assess the risk factors relating to myopia and enter into an early discussion with parents about ways to delay its onset. Once a child is diagnosed with myopia, optometrists should offer evidence-based treatments to manage myopia progression, with appropriate regular follow up care in order to assess the efficacy of, and adjust, the treatment plan.

Global support for a myopia management standard of care would support the call for optometrists having an ethical duty to educate themselves and their patients on the latest evidence in myopia management.<sup>26</sup>

The CAO supports the position of the World Council of Optometry and endorses evidence-based myopia management as a standard of care for all at-risk patients.

## References:

1. Bourne RR, Stevens GA, White RA, Smith JL, Flaxman SR, Price H, et al. Causes of vision loss worldwide, 1990-2010: a systematic analysis. *Lancet Glob Health*. 2013;1(6):e339-49.
2. Flitcroft DI, He M, Jonas JB, Jong M, Naidoo K, Ohno-Matsui K, et al. IMI - Defining and Classifying Myopia: A Proposed Set of Standards for Clinical and Epidemiologic Studies. *Invest Ophthalmol Vis Sci*. 2019;60(3):M20-M30.
3. Flitcroft DI. The complex interactions of retinal, optical and environmental factors in myopia aetiology. *Prog Retin Eye Res*. 2012;31(6):622-60.
4. Holden BA, Fricke TR, Wilson DA, Jong M, Naidoo KS, Sankaridurg P, et al. Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050. *Ophthalmology*. 2016;123(5):1036-42.
5. Lin LL, Shih YF, Hsiao CK, Chen CJ. Prevalence of myopia in Taiwanese schoolchildren: 1983 to 2000. *Ann Acad Med Singapore*. 2004;33(1):27-33.
6. Group C. Myopia stabilization and associated factors among participants in the Correction of Myopia Evaluation Trial (COMET). *Invest Ophthalmol Vis Sci*. 2013;54(13):7871-84.
7. Chua SY, Sabanayagam C, Cheung YB, Chia A, Valenzuela RK, Tan D, et al. Age of onset of myopia predicts risk of high myopia in later childhood in myopic Singapore children. *Ophthalmic Physiol Opt*. 2016;36(4):388-94.
8. Hu Y, Ding X, Guo X, Chen Y, Zhang J, He M. Association of Age at Myopia Onset With Risk of High Myopia in Adulthood in a 12-Year Follow-up of a Chinese Cohort. *JAMA Ophthalmol*. 2020;138(11):1129-34.
9. Yang M, Luensmann D, Fonn D, Woods J, Jones D, Gordon K, et al. Myopia prevalence in Canadian school children: a pilot study. *Eye (Lond)*. 2018;32(6):1042-7.
10. Fricke TR, Jong M, Naidoo KS, Sankaridurg P, Naduvilath TJ, Ho SM, et al. Global prevalence of visual impairment associated with myopic macular degeneration and temporal trends from 2000 through 2050: systematic review, meta-analysis and modelling. *Br J Ophthalmol*. 2018;102(7):855-62.
11. WHO. The Impact of Myopia and High Myopia. World Health Organization; 2015.
12. Tedja MS, Haarman AEG, Meester-Smoor MA, Kaprio J, Mackey DA, Guggenheim JA, et al. IMI - Myopia Genetics Report. *Invest Ophthalmol Vis Sci*. 2019;60(3):M89-M105.
13. Zhang X, Qu X, Zhou X. Association between parental myopia and the risk of myopia in a child. *Exp Ther Med*. 2015;9(6):2420-8.
14. Tang SM, Kam KW, French AN, Yu M, Chen LJ, Young AL, et al. Independent Influence of Parental Myopia on Childhood Myopia in a Dose-Related Manner in 2,055 Trios: The Hong Kong Children Eye Study. *Am J Ophthalmol*. 2020;218:199-207.
15. Xiong S, Sankaridurg P, Naduvilath T, Zang J, Zou H, Zhu J, et al. Time spent in outdoor activities in relation to myopia prevention and control: a meta-analysis and systematic review. *Acta Ophthalmol*. 2017;95(6):551-66.

16. Eppenberger LS, Sturm V. The Role of Time Exposed to Outdoor Light for Myopia Prevalence and Progression: A Literature Review. *Clin Ophthalmol*. 2020;14:1875-90.
17. Rudnicka AR, Owen CG, Nightingale CM, Cook DG, Whincup PH. Ethnic differences in the prevalence of myopia and ocular biometry in 10- and 11-year-old children: the Child Heart and Health Study in England (CHASE). *Invest Ophthalmol Vis Sci*. 2010;51(12):6270-6.
18. Grzybowski A, Kanclerz P, Tsubota K, Lanca C, Saw SM. A review on the epidemiology of myopia in school children worldwide. *BMC Ophthalmol*. 2020;20(1):27.
19. Saw SM, Goh PP, Cheng A, Shankar A, Tan DT, Ellwein LB. Ethnicity-specific prevalences of refractive errors vary in Asian children in neighbouring Malaysia and Singapore. *Br J Ophthalmol*. 2006;90(10):1230-5.
20. Huang HM, Chang DS, Wu PC. The Association between Near Work Activities and Myopia in Children-A Systematic Review and Meta-Analysis. *PLoS One*. 2015;10(10):e0140419.
21. Guo L, Yang J, Mai J, Du X, Guo Y, Li P, et al. Prevalence and associated factors of myopia among primary and middle school-aged students: a school-based study in Guangzhou. *Eye (Lond)*. 2016;30(6):796-804.
22. Do CW, Chan LYL, Tse ACY, Cheung T, So BCL, Tang WC, et al. Association between Time Spent on Smart Devices and Change in Refractive Error: A 1-Year Prospective Observational Study among Hong Kong Children and Adolescents. *Int J Environ Res Public Health*. 2020;17(23).
23. Public Health Agency of Canada. Economic Burden of Illness in Canada, 2010, February 2018.
24. Gordon, K. The Cost of Vision Loss in Canada. Canadian Council of the Blind. 2021
25. Takashima T, Yokoyama T, Futagami S, Ohno-Matsui K, Tanaka H, Tokoro T, et al. The quality of life in patients with pathologic myopia. *Jpn J Ophthalmol*. 2001;45(1):84-92.
26. Bullimore MA, Ritchey ER, Shah S, Leveziel N, Bourne RRA, Flitcroft DI. The Risks and Benefits of Myopia Control. *Ophthalmology*. 2021.
27. Walline JJ, Lindsley KB, Vedula SS, Cotter SA, Mutti DO, Ng SM, et al. Interventions to slow progression of myopia in children. *Cochrane Database Syst Rev*. 2020;1:CD004916.
28. Wildsoet CF, Chia A, Cho P, Guggenheim JA, Polling JR, Read S, et al. IMI - Interventions Myopia Institute: Interventions for Controlling Myopia Onset and Progression Report. *Invest Ophthalmol Vis Sci*. 2019;60(3):M106-M31.
29. Bullimore MA, Richdale K. Myopia Control 2020: Where are we and where are we heading? *Ophthalmic Physiol Opt*. 2020;40(3):254-70.