International Agency for the Prevention of Blindness
WeWork 1 St Katharine's Way
International House, 6th Floor
E1W 1UN

Tel: +44 (0) 203 950 8778
Email: communications@iapb.org
www.iapb.org

POSITION PAPER

Addressing myopia: best practices and minimum standards in clinical practice

IAPB adopts advisory positions to guide the work of its members and their stakeholders. This position paper has been developed by members of the Refractive Error Working Group based on their learnings, available published evidence and existing position papers by IAPB.

The paper focuses on best practice and minimum standards for clinical interventions – that is, providing appropriate optical correction and slowing the progression of myopia. It does not address regulatory or professional standards specific to varying country contexts. This paper does not suggest that IAPB is responsible for the actions of its members or responsible for ensuring its members follow these guidelines.

Public health interventions and practices for preventing or delaying the onset of myopia, or reducing myopia progression, are out of scope of this paper and will be addressed in a subsequent paper.

Myopia, or “short-sightedness” or “near-sightedness” as it is generally known, causes distant objects to be focused in front of the retina and thus appear blurry.[1] Myopia emerges in childhood and, although not limited to this period, an individual’s myopia generally increases through the teenage years. While it can be corrected with glasses, uncorrected myopia has a profound impact on an individual’s ability to perform regular tasks.[2] Uncorrected refractive error is the number one cause of avoidable vision impairment worldwide of which uncorrected myopia is the main cause.[3-5] The global potential productivity loss associated with the burden of visual impairment from uncorrected myopia and myopic macular degeneration (MMD) alone, in 2015 was estimated at US$250 billion with much of it located in developing Asian regions.[6]

Myopia is of critical concern at this time because its prevalence has been increasing dramatically around the world.[7] In 2020, myopia affected 30% (1.9 billion) of the world population, but by 2050 that is predicted to increase to 50% (5 billion) of the world population, with 10% (1 billion) highly myopic.[7] Increasing myopia also increases the risk of sight-threatening complications such as glaucoma, cataracts, retinal detachment and myopic macular degeneration.[8,9] Myopic macular degeneration is more frequently seen in adults over 40 years of age, but has already been reported as the number one cause of blindness in parts of China[10] and Japan.[11] The number of people predicted to be visually impaired from myopic macular degeneration alone by 2050 is 55.7 million, of which 18.5 million will be blind.[12]

Myopia has traditionally been corrected with spectacles or contact lenses. There is now substantial evidence and emerging consensus supporting the prevention of myopia and reducing its progression in children with various behavioural and clinical interventions.[8,13-16] The interventions include lifestyle changes, and optical and pharmacological management. They aim to reduce the potential eye health concerns associated with increasing myopia, and have been shown effective and safe in children.[13]

POSITION STATEMENT

Given the critical need for good distance vision in performing daily tasks and addressing the myopia epidemic[17] and the associated vision impairment and blindness, IAPB recommends that myopia must be prioritised and addressed. The principles that IAPB endorses are focused on providing appropriate optical correction and slowing the progression increase of myopia simultaneously. This is done by ensuring human resources, and health system fit, and by adapting the best practice or minimum standards depending on the specific context.

Method of myopia management

Best practice for managing myopia in children and teenagers is using a method that simultaneously slows the increase in myopia while fully correcting their vision. Under-correction and overcorrection are not advocated due to the small risk of increasing the myopia.[16] Effective optical interventions available to correct vision and slow the increase in myopia include: executive bifocal spectacles, defocus incorporated multiple segment (DIMS) spectacles , orthokeratology contact lenses, and various types of multifocal soft contact lenses. Progressive additional lenses and peripheral defocus lenses are less effective in slowing myopia progression. Orthokeratology contact lenses are worn overnight, while all other optical interventions are worn full time while awake. While doing this, it is important to recognize that the spectacles delivered are of good quality and there is advocacy in place to encourage they been worn.

Pharmacologic treatment shown to be effective in slowing myopia progression is the drug atropine. Low-dose atropine is recommended if available due to less adverse effects as compared to the higher doses. Refractive correction is still required to address the myopia that is present.

There is evidence now to suggest that combined treatments may be more efficacious due to the action on different mechanisms of myopia development. For example, combining orthokeratology and low-dose atropine showed better efficacy than orthokeratology alone.[18] Combination therapy may be considered in cases where effective slowing of myopia is not achieved using one treatment.

Children identified as having pre-myopia should receive a regular review of their vision and, as appropriate, they, their parents/caregivers and teachers should also receive lifestyle counselling to help them make the necessary lifestyle changes needed to prevent or slow the myopia progression. Pre-myopia is the stage prior to

development of myopia where a child's spherical equivalent of refraction is between -0.50 D up to +0.75D and is considered reduced for their age, and may include a combination of risk factors such as familial history and lifestyle risks.[1]

It is suggested that children and teenagers found to have a spherical equivalent of refraction equal to -0.50 D[1] (uncorrected visual acuity of 6/7.5 or worse) consider undergoing treatment for myopia managed using the above mentioned options along with regular monitoring of their refraction. Diagnostic testing should include cycloplegic refraction, axial length measurement (if available), accommodation and binocular vision assessment, and a thorough assessment of their ocular health. Some of the treatments may have slight risks due to the unknown long-term effects of chronic low-dose atropine use, or increased risk of microbial keratitis with contact lens use in children and overnight orthokeratology.[16] Regular monitoring of these patients according to established treatment protocols is recommended".

To determine the optimal treatment, the individual's exact prescription including distance refractive error, astigmatism, pupillary distance, and other personal risk factors need to be taken into account.[15,19] Spectacle frames must be adjusted and fit well on the individual's face to ensure the lens treatment zones reach the eye. Custom-made spectacles require an edging and fitting facility while the contact lens options require distribution networks in the market. Ready-made spectacles are not a reasonable alternative for children and teenagers as under-correction and over-correction may increase the risk of myopia progression.[20,21]

Adults with myopia with minimal risk of myopia progression can be corrected using custom-made or ready-made spectacles (as described in the IAPB position paper on ready-made spectacles (2015), ready-made spectacles are suitable for powers up to +3.50 diopters, when there is less than 1.00 diopter difference between the eyes, or less than or equal to 0.75 diopters of cylinder in one or both eyes. The ready-made spectacles should reach quality assurance levels as required by the international standard ISO 16034:2002).

All individuals should be encouraged to take regular breaks from near work and spend at least 120 minutes additional time outdoors per day (with sun protection measures),[22] as time outdoors has been shown to reduce new cases of myopia, despite not achieving significant slowing in existing myopia.[23] Additional lifestyle benefits of spending time outdoors may benefit other aspects of health promotion and prevention, including preventing obesity in children.

Regular dilated eye examination to ensure a complete assessment of the health of the inside of the eye is important given the increased risk of ocular pathology in myopia, especially in the higher levels of myopia.[24] Detecting eye disease early will ensure appropriate treatment to prevent vision impairment and blindness.

Human resources and health system fit

Where available, best practice for assessing myopia and other ocular conditions requires the individual to undergo a full eye examination by an optometrist or ophthalmologist, using cycloplegia (if available) integrated within the existing health care system.

However, given the challenges of inadequate numbers of optometrists and ophthalmologists in low resource settings and access to advanced optical products, the IAPB advocates as a minimum standard that myopia be assessed by a suitably trained person, who would be able to measure visual acuity, assess the refractive error and screen and refer any ocular pathology and for myopia management. Therefore, a referral pathway must exist.

The principles, best practice, and minimum standards as endorsed by IAPB are summarized in Table 1.

Table 1: Options for children and adults progressing in myopia adapted from the International Myopia Institute white papers. REF

Principle	Best Practice	Minimum Standard
Method of management	• Defocus incorporated multiple segment spectacles • High aspheric lens spectacles • Flat-top 35 or Executive bifocal spectacles • Ortho-k contact lenses • Multifocal type soft contact lenses (including FDA approved MiSight contact lenses) • Low-dose atropine (requires additional vision correction)	• Executive bifocal spectacles • Progressive addition spectacles • Peripheral defocus spectacles • Full correction with single vision distance spectacles or contact lenses (avoiding under- or over-correction)
Human resources	Optometrist/ Ophthalmologist undertaking full cycloplegic eye examination at appropriate intervals	Suitably trained person undertaking a visual acuity test and screening for ocular pathology using appropriate cycloplegia.
Health system fit	Integration within existing health care system	Referral pathway exists

Adults with stable myopia

Principle	Best Practice	Minimum Standard
Method of management	• Eye examinations at appropriate intervals • Custom made, full correction in appropriate lens design	• Ready-made spectacles
Human resources	Optometrist/ Ophthalmologist undertaking full cycloplegic eye examination	Suitably trained person undertaking a visual acuity test and screening for ocular pathology using appropriate cycloplegia.
Health system fit	Integration within existing health care system	Referral pathway exists

References

1. Flitcroft DI, He M, Jonas JB, et al. IMI - Defining and Classifying Myopia: A Proposed Set of Standards for Clinical and Epidemiologic Studies. *Investigative ophthalmology & visual science* 2019; **60**(3): M20-M30.
2. Sankaridurg P, Tahhan N, Kandel H, et al. IMI Impact of Myopia. *Investigative ophthalmology & visual science* 2021; **62**(5): 2.
3. Bourne RRA, Steinmetz JD, Flaxman S, et al. Trends in prevalence of blindness and distance and near vision impairment over 30 years: An analysis for the Global Burden of Disease Study. *The Lancet Global Health* 2021; **9**(2): e130-e43.
4. Bourne RRA, Steinmetz JD, Saylan M, et al. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: The Right to Sight: An analysis for the Global Burden of Disease Study. *The Lancet Global Health* 2021; **9**(2): e144-e60.
5. Burton MJ, Ramke J, Marques AP, et al. The Lancet Global Health Commission on Global Eye Health: vision beyond 2020. *Lancet Glob Health* 2021; **9**(4): e489-e551.
6. Naidoo KS, Fricke TR, Frick KD, et al. Potential Lost Productivity Resulting from the Global Burden of Myopia: Systematic Review, Meta-analysis, and Modeling. *Ophthalmology* 2019; **126**(3): 338-46.
7. Holden BA, Fricke TR, Wilson DA, et al. Global prevalence of myopia and high myopia and temporal trends from 2000 through 2050. *Ophthalmology* 2016; **123**(5): 1036-42.
8. World Health Organization, Brien Holden Vision Institute. The impact of myopia and high myopia. Report of the Joint World Health Organization - Brien Holden Vision Institute (WHO-BHVI) Global Scientific Meeting on Myopia held at the University of New South Wales in Sydney, Australia, 16-18 March 2015. Geneva: World Health Organization; 2016.
9. Flitcroft DI. The complex interactions of retinal, optical and environmental factors in myopia aetiology. *Progress in retinal and eye research* 2012; **31**(6): 622-60.
10. Wu L, Sun X, Zhou X, Weng C. Causes and 3-year-incidence of blindness in Jing-An District, Shanghai, China 2001-2009. *BMC Ophthalmol* 2011; **11**: 10.
11. Iwase A, Araie M, Tomidokoro A, et al. Prevalence and causes of low vision and blindness in a Japanese adult population: the Tajimi Study. *Ophthalmology* 2006; **113**(8): 1354-62.

12. Fricke TR, Jong M, Naidoo KS, 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.
13. Walline JJ, Lindsley KB, Vedula SS, et al. Interventions to slow progression of myopia in children. *The Cochrane database of systematic reviews* 2020; **1**: CD004916.
14. Nemeth J, Tapaszto B, Aclimandos WA, et al. Update and guidance on management of myopia. European Society of Ophthalmology in cooperation with International Myopia Institute. *Eur J Ophthalmol* 2021; **31**(3): 853-83.
15. Gifford KL, Richdale K, Kang P, et al. IMI - Clinical Management Guidelines Report. *Investigative ophthalmology & visual science* 2019; **60**(3): M184-M203.
16. Wildsoet CF, Chia A, Cho P, et al. IMI - Interventions for Controlling Myopia Onset and Progression Report. *Investigative ophthalmology & visual science* 2019; **60**(3): M106-M31.
17. Dolgin E. The myopia boom. *Nature* 2015; **519**(7543): 276-8.
18. Kinoshita N, Konno Y, Hamada N, Kanda Y, Shimmura-Tomita M, Kakehashi A. Additive effects of orthokeratology and atropine 0.01% ophthalmic solution in slowing axial elongation in children with myopia: first year results. *Jpn J Ophthalmol* 2018; **62**(5): 544-53.
19. Jonas JB, Ang M, Cho P, et al. IMI Prevention of Myopia and Its Progression. *Investigative ophthalmology & visual science* 2021; **62**(5): 6.
20. Adler D, Millodot M. The possible effect of undercorrection on myopic progression in children. *Clin Exp Optom* 2006; **89**(5): 315-21.
21. Chung K, Mohidin N, O'Leary DJ. Undercorrection of myopia enhances rather than inhibits myopia progression. *Vision Res* 2002; **42**(22): 2555-9.
22. Morgan IG, Wu PC, Ostrin LA, et al. IMI Risk Factors for Myopia. *Investigative ophthalmology & visual science* 2021; **62**(5): 3.
23. Xiong S, Sankaridurg P, Naduvilath T, 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.
24. Haarman AEG, Enthoven CA, Tideman JWL, Tedja MS, Verhoeven VJM, Klaver CCW. The Complications of Myopia: A Review and Meta-Analysis. *Investigative ophthalmology & visual science* 2020; **61**(4): 49.