Myopia Management Algorithm

Annex to the article titled Update and Guidance on Management of Myopia. European Society of Ophthalmology in cooperation with International Myopia Institute

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Abstract

Myopia is becoming increasingly common in young generations all over the world, and it is predicted to become the most common cause of blindness and visual impairment in later life in the near future. Because myopia can cause serious complications and vision loss, it is critical to create and prescribe effective myopia treatment solutions that can help prevent or delay the onset and progression of myopia. The scientific understanding of myopia's causes, genetic background, environmental conditions, and various management techniques, including therapies to prevent or postpone its development and slow its progression, is rapidly expanding. However, some significant information gaps exist on this subject, making it difficult to develop an effective intervention plan. Where there is no evidence, expert consensus is better than no guidance, which leads to confusion and poor adoption. As with the creation of this present algorithm, a compromise is to work on best practices and reach consensus among a wide number of specialists. The quick rise in information regarding myopia management may be difficult for the busy eye care provider, but it necessitates a continuing need to evaluate new research and implement it into daily practice. To assist eye care providers in developing these strategies, an algorithm has been proposed that covers all aspects of myopia mitigation and management. The algorithm aims to provide practical assistance in choosing and developing an effective myopia management strategies tailored to the individual child. It incorporates the latest research findings and covers a wide range of modalities, from primary, secondary, and tertiary myopia prevention to interventions that reduces the progression of myopia. The algorithm was developed by members of the board of the European Society of Ophthalmology (SOE) in cooperation with invited experts and European authors of the International Myopia Institute. The algorithm was endorsed by the SOE executive board.

Key words: myopia, pre-myopia, preventive medicine, screening, time spent outdoors, myopia control interventions, atropine, orthokeratology, management algorithm

Introduction

The major aim of this Algorithm Annex to the "*Update and Guidance on Management of Myopia. European Society of Ophthalmology in cooperation with International Myopia Institute*"[1] is to give practical advice to eye care providers in choosing and developing an effective myopia management strategy for their patients. The Annex presents current knowledge in the form of flowcharts and is focused on prevention and delaying onset and then slowing down progression: from environmental variables to avoid myopia onset, through screening and follow-up of pre-myopes to prevent or postpone myopia development, and eventually to myopia management to reduce myopia progression. The rapid increase in knowledge regarding myopia management could be challenging for the busy eye care provider but warrants an ongoing need to monitor new research and incorporate it into personal everyday practice.[2]

Limitations

Although extensive literature has been published on myopia management and is freely available, important knowledge gaps have remained, which can lead to difficulties in creating a robust myopia algorithm. In some areas, evidence is difficult to obtain e.g., it is becoming increasingly difficult to conduct randomized controlled trials (RCTs) involving a placebo arm, as this may now be considered unethical,[3,4] and because there are individual variations in the progression of myopia, randomization in itself is challenging.[5] The main aim of this sub-chapter is to explain the limits of a myopia management algorithm and to demonstrate the present gaps in knowledge in order to initiate additional research in these areas.

Why is it not possible to provide simple algorithm(s) or guideline(s), given the present state of the science of myopia control?

- There is a wide variety of differences among myopes currently reported in the literature, including, but not limited to, age of onset, sex, ethnicity, family history of myopia, growth rate, and environmental factors, including computer screen time/near work, outdoor time, work-rest regime.
- There are few head-to-head comparisons ("randomized non-inferiority trials") of the various interventions available.[6,7,8] The majority of studies focused on comparing pharmacological and optical treatments against a non-active control. Results indicated that these interventions could potentially slow down myopic progression and reduce axial elongation, but the results are inconsistent. Limited evidence is available for the effects of these interventions after two or three years, and there is still uncertainty about their long-

term effectiveness. There is therefore a need for more rigorous and longer-term studies that compare various myopia control interventions, either used alone or in combination, and for improved methods of monitoring and reporting adverse effects.[9]

- There are no well-designed within-patient comparisons ("repeated cross-over trials") of the various interventions available, so it is not clear whether some interventions are more effective than others in certain groups of patients.
- Comparatively few studies have been carried out in non-Asian countries; therefore, it is currently unclear if the efficacy and side effects of interventions are similar across ethnic groups and geographical regions, even within Europe.
- Legislative rules differ across countries/regions in Europe; certain treatment regimens, such as topical application of atropine eye drops may have to be used in an "off-licence", "off-label" or "no-label" mode. Practitioners may understandably be reluctant to use such unlicensed preparations, as this may expose them to the risk of malpractice claims. In addition, atropine eyedrops are generally only available from compounding pharmacies, where variability in production and stability will affect dosage.[10]

Open questions yet to be addressed *(by RCTs, large independent real-life studies, or other study designs):*

- There is a lack of prevalence data with cycloplegia, as studies not using cycloplegia overestimate the frequency of myopia.
- Which interventions (other than more time spent outdoors and low-dose atropine[11,12]) can be used prophylactically to prevent or delay onset of myopia and its complications? Could risk factor matrices or scoring systems be useful here to identify when prophylactic use is most indicated?[13]
- Which intervention to start and at what age?
    -- direct comparisons using – randomized non-inferiority trials examining the efficacy of different treatments (as 1st line therapy).
- What factors influence treatment decisions and treatment outcomes?
    -- age of myopia onset? rate of previous myopic progression? family history? sex? ethnicity? binocularity? pupil size? lifestyle conditions? social-economic status? etc? and the interactions between these factors?
- What is the optimal age to start treatment for different types of myopia (pre-school, primary school, secondary school, and young adulthood)?
- Is switching treatment modality effective, and if so, which to which intervention should a patient be switched?
    -- repeated cross-over trials to search for scientific evidence of "non-responders"
    -- right time to switch to another intervention?
    -- head-to-head comparisons of different switching orders and timings
    -- what action to take when intervention fails to control myopia progression?
- Which combination therapy?

-- direct comparisons of different combination therapies using randomized non-inferiority trials

- More data (possibly a systematic review or meta-analysis) is required on the prevalence (and possible characteristics) of patients who fail to respond to the various interventions.
- Treatment duration and cessation?

-- comparative data on when and how to stop interventions? Research to test the continuation of efficacy beyond 2-3 years is very limited. Issue of plateau effects/rebound effects.

Further points which are important:

- The lack of a centralised data repository for all clinical studies or trials. Although there have been discussions about the creation of a central repository for all data that would allow meta-analyses, no central repository has yet been set up.
- The field of myopia control is constantly expanding, and new methods of myopia control are being trialled regularly. This paper includes only the treatment modalities that are currently regulated and widely used for myopia control and prevention.

Solutions used to overcome the aforementioned limitations:

The main aim in developing this algorithm was to be as close as possible to the science-based evidence. A challenge exists primarily where no evidence is available. A compromise is to work on "best practices" or "consensus" basis by many experts in the field of myopia. Not doing so leads to a lack of guidance for practitioners to follow, resulting in confusion and poor adoption. The main process was the circulation of the drafts for expert commentary, and when needed, methods inspired from Delphi Panel[13] were used to generate consensus in a structured way.

The algorithm was developed by members of the board of the European Society of Ophthalmology in cooperation with invited experts and European authors of the International Myopia Institute. The algorithm was endorsed by the SOE executive board.

Algorithm

Prevention or delay of myopia onset (primary prevention measures)

1. The main aim is to provide lifestyle advice for any child whereby the clinical evaluation indicates a possibility of reducing the risk of or at least delaying myopia onset. Delaying myopia onset is important because postponing the onset of myopia is expected to reduce the ultimate magnitude of myopia and hence the risk of future high and pathologic myopia.[1,15-17] The most important primary prevention measures are listed in Table 1.

Table 1. Recommendation for primary prevention or delay of myopia onset for school-aged children (Level I is the highest evidence (details see in Elsevier evidence levels)[18])

Life situation	Recommendation	Level of evidence[18]
Time outdoor	1-2 hours of outdoor activity every day.[19-21]	Level I
Near work	Limit the length of time spent continuously reading or other near work to 30 to 45 minutes followed by a break.[22,23]	Level II
	Read from a greater distance: more than 20-30 cm.[22-25]	Level III

Time spent outdoors is well recognized as a factor preventing the development of myopia (evidence: Level I).[18] It is recommended to spend as much time as possible in natural daylight (with appropriate skin protection from ultraviolet radiation), regardless of age. The timing, brightness and UV light exposure play important role in controlling myopia during outdoor activity.[26-28]
For school-aged children to have clinically significant protection from myopiagenic stimuli, it is advised that they participate in at least two hours of outdoor activity every day.[1,2,20,29]

In parallel with more time spent outdoors, it may be beneficial to promote a healthy visual environment to limit the length of continuous time spent at near work: reading at a short distance or using a close-up screen (Level II and III evidence, Table 1). For any reading or other activity performed at short distances, the distance should be increased to a minimum of 20-30 cm.[22-25] In addition, one may discuss whether, except for schoolwork, the time spent with reading or with other activities at short distances should be reduced to no more than 30 to 45 minutes,[22,23] followed by an ideal break of 5-10 minutes (it may be more effective to take longer breaks, such as five minutes per hour, than the well-known 20-20-20 ocular discomfort rules to lower the risk of myopia).[30,31] Data issuing from the COVID-19 pandemic has indicated that using TV displays or projectors for online learning is preferable to using tablets, mobile phones, or PC screens when trying to provide a less myopiagenic environment for children.[32]

Natural daylight or exceptionally bright indoor light (over 2500 Lux) are beneficial to use indoors (Level III evidence).[24,33-38] The WHO's guidance on physical activity, sedentary behaviour and sleep recommends that children under the age of two years avoid using screens at short distances. For children up to five years old, screen time at short distances should be limited to one hour per day.[39] These recommendations were developed for a wider child-health purpose but may also be helpful in relation to myopia. For children aged five to twelve years, the Erasmus Myopia Research Group has argued that a maximum of two hours per day may be a sensible recommendation.[40]

Education campaigns for myopia management and eye care awareness are supported by the MyopiaEd toolkit, developed by the World Health Organization (WHO) and the International Telecommunication Union (ITU). The toolkit provides evidence-based messages for targeted digital communication and implementation guidance.[41]

A few studies have recently examined the impact of low dose atropine for the prevention or delaying onset of myopia. Atropine at 0.025% and 0.05% was effective in delaying or preventing the onset of myopia in pre-myopes (0.0D to +1.0D) compared to the control group; however, this finding needs to be confirmed through additional research and it is suggested that the concentration should be as low as possible to minimize adverse effects and encourage compliance.[11,12] (See a more detailed discussion of atropine treatment in the tertiary prevention section, in points 10-11).

2. The initial step of the algorithm is a cycloplegic refraction (Figure 1). The use of cycloplegia is recommended to establish the diagnosis of premyopia or prevent an overdiagnosis of myopia as well as to provide a robust and more repeatable baseline measurement of myopia with which to compare future measures.[42,43] If cycloplegia is not performed, the eye care provider must ensure that the eye is unaccommodated.[44,45] Consideration of the uncorrected distance vision will aid in confirming or refuting the presence of myopia where a non-cycloplegic result is utilised.

Myopia is not very common (0.2–3.7%) in children under the age of six years, even in Asia,[1,46,47] suggesting that a screening examination for myopia may be most effective when conducted around the age of six, when children start school. In children with myopia onset at an age of less than 6 years, forms of secondary myopia such as Stickler´s syndrome and other conditions should be considered/investigated.[1,48,49]

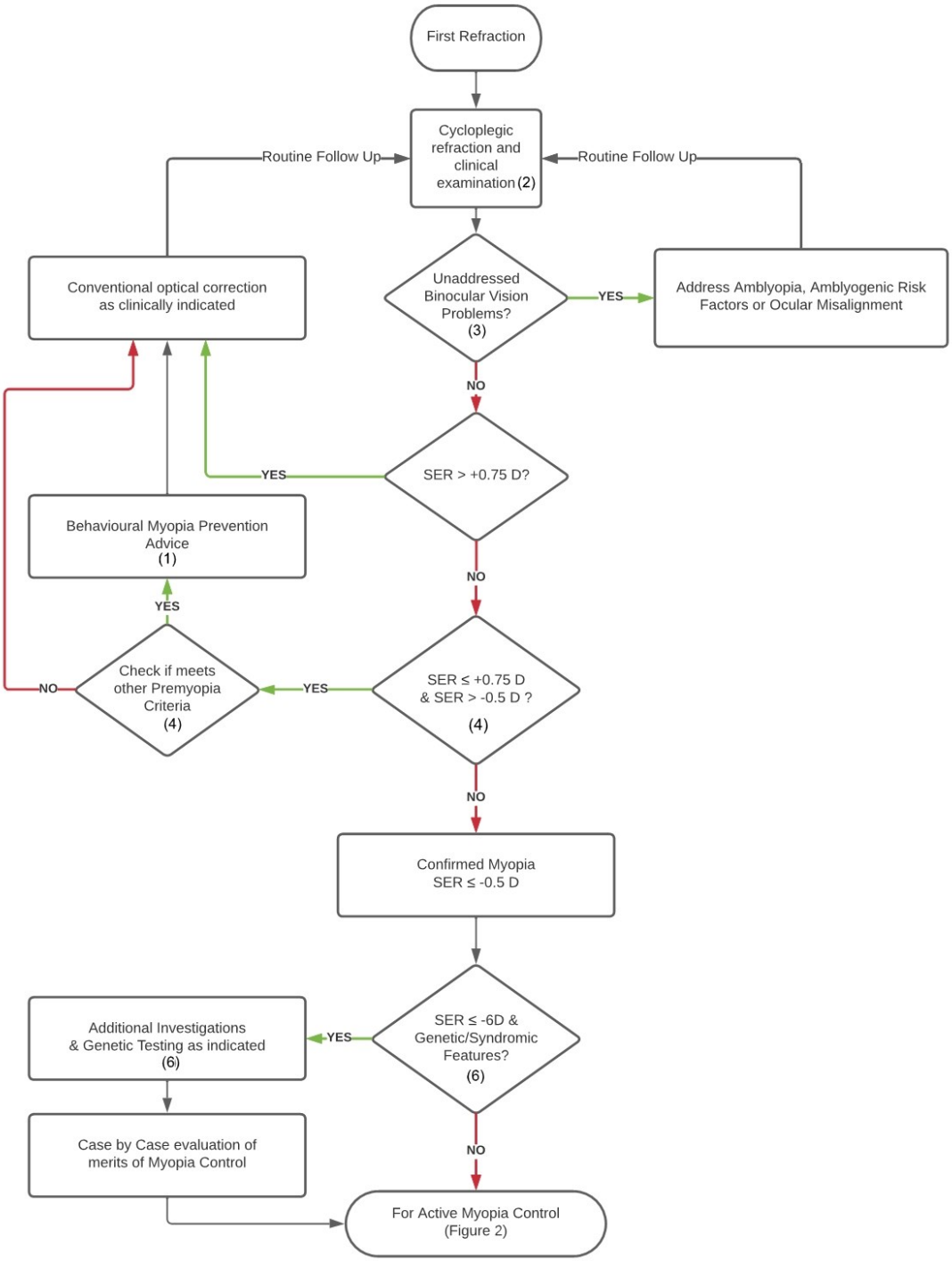
First Refraction
Cycloplegic refraction and clinical examination (2)
Routine Follow Up
Routine Follow Up
Conventional optical correction as clinically indicated
Unaddressed Binocular Vision Problems? (3)
YES
Address Amblyopia, Amblyogenic Risk Factors or Ocular Misalignment
NO
SER > +0.75 D?
YES
Behavioural Myopia Prevention Advice (1)
NO
YES
Check if meets other Premyopia Criteria (4)
NO
YES
SER ≤ +0.75 D & SER > -0.5 D ? (4)
NO
Confirmed Myopia SER ≤ -0.5 D
SER ≤ -6D & Genetic/Syndromic Features? (6)
YES
Additional Investigations & Genetic Testing as indicated (6)
Case by Case evaluation of merits of Myopia Control
NO
For Active Myopia Control (Figure 2)

Figure 1. Initial refractive assessment flowchart. Algorithm for the primary and secondary prevention of myopia. Numbers refer to the stages identified in the text. (D: diopter, SER: spherical equivalent refraction).

Screening of premyopes (secondary prevention measures)

3. Studies have shown a complex relationship between near-work, ocular accommodation, and myopia development, with no clear causative relationship.[50] Studies have found that the accommodative convergence-to-accommodation (AC/A) ratio is elevated in myopic children and has been documented to be elevated prior to myopia onset, as early as four years prior. However, increased lag of accommodation has not been found to be predictive of myopia onset or progression.[50] Since a sharp image on the retina decreases the risk of developing myopia, eye care practitioners should still assess the accommodation and convergence systems in all children to ensure normal visual development.[50]

4. Premyopia is the refractive state of an eye which under cycloplegia has a spherical equivalent between ≤+0.75 D and >-0.5 D. Children aged 6-8 years with pre-myopia have an increased risk of future development of myopia, particularly in conjunction with other quantifiable risk factors such as family history of myopia and ethnicity.[42] Analysis of the risk factors for myopia must be carried out for every child. In addition to quantifiable risk factors such as family history of parental myopia, ethnicity, age, and female sex, lifestyle factors such as less time spent outdoors and more time spent in near work activities should be explored (Table 2).[1,17] Monitoring axial length changes is a valuable tool for screening and follow-up of premyopes and also for myopia control because the visual consequences of myopia are closely tied to axial elongation.[51-53] A growth chart of the eye is a pillar for myopia management. Children who are in the higher percentiles of axial length and those who cross percentiles, indicating more than natural growth, are at increased risk for myopia or even high myopia.[54,55]

To reduce the risk of myopia, it is recommended to regularly monitor premyopes using the axial growth chart percentile curve.[54,55] In terms of follow-up, the duration may vary for each individual based on factors such as risk factors and eye length. However, in general, a 6-month follow-up period is recommended.

Table 2. Risk factors associated with prevalence or progression of myopia

Ethnicity	East-Asians are at higher risk for myopia and high myopia.[1,56-60]
Sex	Females are at higher risk for myopia at about 9 years of age and above. [1,17,56,57]

Age of myopia onset	The annual progression is much greater for those with an early onset, and the most rapid progression between age 6-12 years. [1,56,61-68]
Parental myopia	Myopia is more likely to develop if one or both parents are myopic. [1,17,56] If both parents are high myopes the risk of fast progression is increased for the child.[69]
Time spent outdoor	Increasing outdoor exposure is effective in preventing or delaying the onset of myopia. [1,17,56,57,70]
Education / Near work	More time (and longer continuous time) spent on near-work activities also in the context of less outdoor activity increases the likelihood of developing myopia. [1,17,56] There is a significant association between digital screen time in the context of more near work and myopia. [1,17,70]

Reduction of myopia progression (tertiary prevention measures)

5. It is the duty of every eye care provider to proactively discuss myopia control measures with parents and myopic children and offer appropriate interventions (a refractive error of -0.5 D or stronger under cycloplegia) or refer to an appropriate colleague if they do not feel comfortable managing myopia (Figure 2). Although the risk for visual impairment increases to 25% in eyes with an axial length greater than 26 mm and exceeds 90% when the axial length is over 30 mm,[51] it is essential to note that even low and moderate myopia at an early age pose an increased risk.[52,53] The need to promote suitable evaluation methods and viable myopia control strategies is essential (environmental, optical, pharmacological). In addition to the optimization of environmental influences (Table 1 and 2), the two basic interventions for which there is currently the most evidence to support efficacy are optical and pharmacological.

There are several criteria to consider when deciding which option to choose. These include the availability of the option in the patient's country, the practicality of the option given the patient's lifestyle or financial situation, the eye care provider's familiarity with the procedure, and the availability of appropriate instrumentation. If one intervention method fails, another maybe tried, or methods can be combined.[1,2,71,72]

It should be noted that at present, while these interventions have been shown to be efficacious in many children, children do not all respond equally, and some children do not respond and continue to progress at pace. Eye care practitioners should not over-promise and more research is needed to develop more targeted and personalised approaches to myopia management.

6. After diagnosing high myopia in pre-school children, it's important to determine if there are any associated medical conditions that take priority. A comprehensive clinical history and biometric evaluation are crucial. Further specialized investigations and multidisciplinary evaluations may be necessary, requiring referral to a tertiary care facility following initial diagnosis in primary care. While low-risk interventions can be used for childhood myopia, there's limited evidence of effectiveness for high myopia and syndromic forms. Close monitoring of refraction and axial length is recommended during therapeutic interventions. Conducting randomized clinical trials for myopia interventions in syndromic and monogenic myopia is impractical due to genetic heterogeneity. Pooling outcome data from different clinical sites in disease registries is a viable option for evidence-based myopia management in this complex subtype.[16]

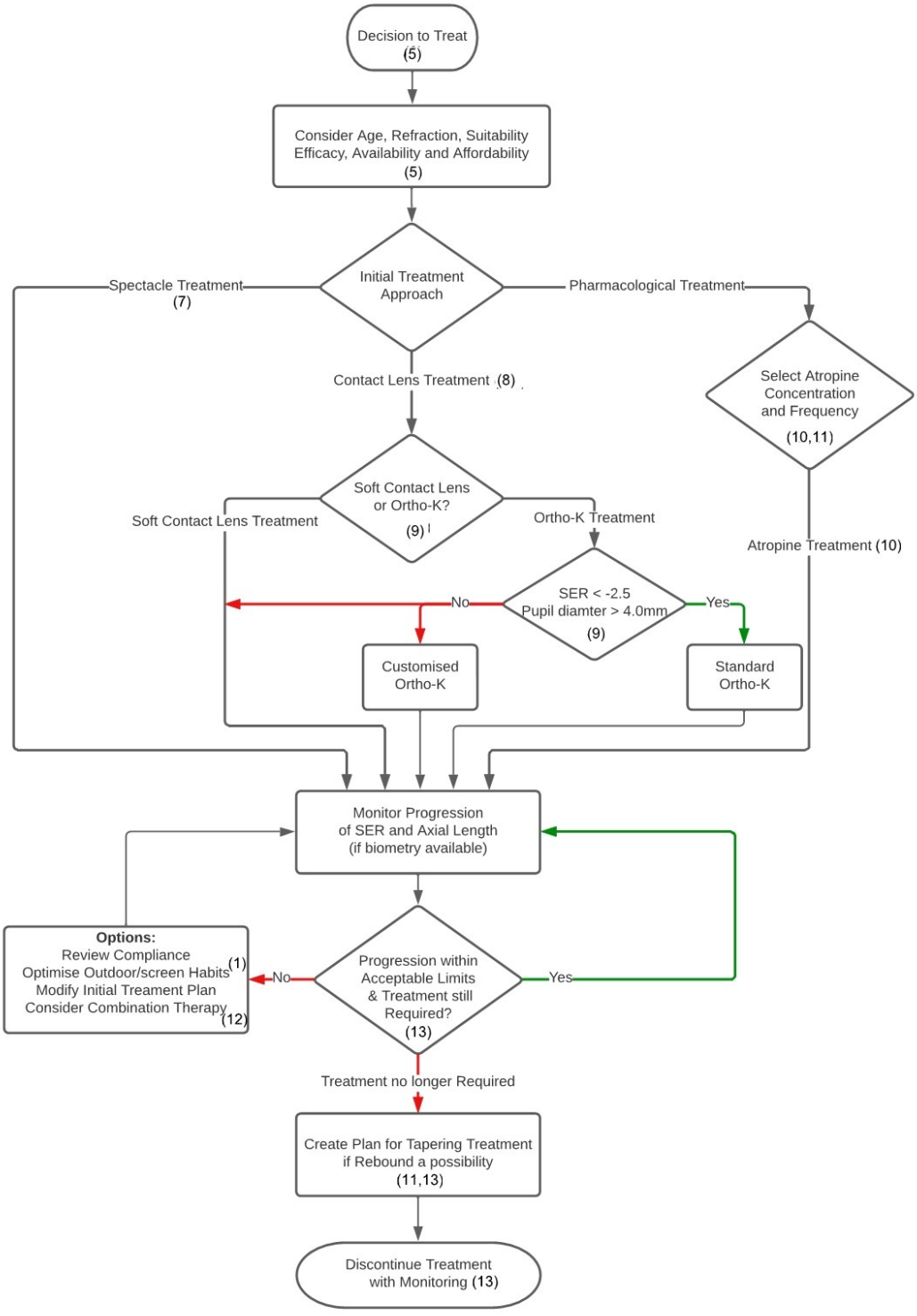

Figure 2. Treatment flowchart. Algorithm for reducing myopia progression. (Ortho-K: orthokeratology, SER: spherical equivalent refraction)

7. Do not under-correct patients with myopia[1,70,73] (low-certainty evidence, Cochrane-2023)[9] nor over-correct.[74] The blue-light blocking glasses have no effect,[75] and the bifocal or progressive additional eyeglasses have a small effect on myopia control.[70,76]

For spectacle correction, the most recent myopia control spectacle lenses are likely to be a good starting point in younger patients as they have been shown to be effective (with the caveats above) and they are the least invasive option.[77-80]

8. In some situations, spectacles are not an option. A child may refuse to wear them for various reasons including sport activities during which wearing spectacles is not feasible. Research has demonstrated that the utilization of contact lenses can enhance the self-perception and engagement of children and teenagers in various activities, resulting in increased satisfaction with the correction of their refractive errors.[44]

When considering myopia management using contact lens corrections the evidence-based options are multifocal soft contact lenses (moderate-certainty evidence, Cochrane-2023),[9] positive spherical aberration contact lenses and night-time orthokeratological lenses (moderate-certainty evidence, Cochrane-2023).[9] Wearing single-vision rigid gas-permeable or soft contact lenses has little to no effect on myopia progression and axial length elongation.[70,76]

Dealing with higher myopia (-6.0 D or stronger), orthokeratology can be used along with optical overcorrection during the day.[81] However, it is important to note that in this situation, there are other options available, such as using anti-myopia spectacles or daytime soft anti-myopia contact lenses.[2,71]
In the case of astigmatism, anti-myopia eyeglasses, regular or customized ortho-K contact lenses may be used.[71] Alternatively, astigmatism could be corrected using spectacle lenses in combination with an anti-myopia contact lens or a soft multifocal toric contact lens could be used, because the uncorrected refractive astigmatism may influence axial elongation.[82]
The most serious complication of contact lens wear is microbial keratitis, for which the lifetime risk associated with children using daily disposable soft contact lenses is low (1:431). The risk is higher in orthokeratology (1:67).[83] However, both of these risks are still lower than the risk of developing complications resulting in vision loss associated with high myopia (greater than -6.0 D or AL >26 mm), which has a risk of 1:10, and similar to the risk of developing complications resulting in vision loss associated with lower myopia (less than -3.0 D or AL <26 mm), which ranges from 1:10 to 1:100.[83]

9. In conventional orthokeratology lenses, the number of diopters reduced on the corneal surface aligns with those adjusted in the mid-periphery.[84] This balance plays a crucial role in counteracting the myopic shift in the peripheral retina[85-87] and aberrations, particularly spherical aberrations and vertical coma.[81,88,89]

Pupil size matters. For pupils 4.0 mm or smaller, daytime soft anti-myopic lenses outperform night-time ortho-K lenses.[90-95] This is because the ortho-K lens's back optical zone diameter (BOZD), which is responsible for distance visual acuity, is typically 6.0 mm. The slowing effect of soft contact lenses is better in narrow pupils, where this therapeutic zone is within 5.0 mm.[96] The BOZD of an ortho-K contact lens in a case of 6.0 mm relates to a 3.1–3.5 mm treatment zone on the cornea.[97,98]

The effectiveness of myopia control increases with a greater difference in surface power,[91,99,100] as well as with a smaller treatment zone diameter[90,92-94,101] (without negatively affecting visual acuity) or a larger pupil size.[90,91,93,95]

Customized ortho-K lenses can boost the myopic shift effect and offer smaller optical zones for narrow pupils, enhancing their efficacy in slowing progression. However, some authors argue that the diameter of the optic zone has minimal impact on peripheral refraction,[102] and pupil size has no significant influence on myopic progression.[103] Other factors should be considered in addition to their long-term effects on the rate of myopia development.[104]

10. Atropine is one of the pillars of myopia control (moderate-certainty evidence, Cochrane-2023).[9] During the past two decades, well-designed clinical studies have reported compelling evidence of its growth inhibiting effect,[105-107] but so far, its use has frequently been off-label in many countries. (Further limitations of atropine have been discussed in the introduction.)[10] Atropine inhibits the progression of myopia in a dose-dependent manner, but it also has dose-dependent rebound effects and dose-dependent adverse events.[1,71,108] Although in the Low-concentration Atropine for Myopia Progression (LAMP) study, the rebound effect was clinically small at all three concentrations (0.01%, 0.025%, 0.05%), discontinuing treatment at an older age and lower concentrations was associated with a smaller rebound effect.[107,108] However, atropine at a low dosage (0.01%) has an insufficient effect on axial elongation.[106,109] The frequency of application or dose may be increased when lower doses are proving ineffective.[106]
In children who are at risk of developing high myopia in adulthood, it has been recommended by some authors to start with a dose of 0.5% atropine.[110] In order to mitigate any potential adverse reactions to this concentration, the use of photochromic glasses and progressive addition lenses is also recommended.[40]
Younger children require a higher (0.05%) concentration of atropine to obtain a similar reduction in myopic progression as compared to older children because younger age is associated with poor treatment response to low concentrations of atropine.[107] According to a recent network meta-analysis, the three concentrations that were most effective for controlling myopia were 1%, 0.5%, and 0.05%. The effects on pupil size and accommodation amplitude were dose-related, and 0.05% was determined to be the most efficient concentration for myopia control as measured by relative risk for total myopia progression.[111]

11. After the age of 12 years, children show less rebound after cessation of atropine. This suggests that in children younger than 12 years of age, more consideration should be given before stopping atropine than in children over 12 years of age.[112,113]
Evidence based guidelines regarding how to taper doses have not yet been established. Sudden discontinuation of a higher dose of atropine can lead to an increased rate of myopic refractive error progression[105], although according to some publications, in the case of lower doses, this is not substantiated by accelerated axial length growth.[106] Nevertheless, when children have been treated with higher doses of atropine, a tapering schedule to low doses of atropine is recommended to minimize the risk of a rebound effect.[110] Close axial length monitoring would be useful to monitor for potential rebound during tapering.

12. In combination therapy, optical interventions are paired with atropine (moderate-certainty evidence, Cochrane-2020).[114] Combination treatment was found to slow myopia progression significantly more than each treatment alone.[1,71,115]
Studies demonstrated that combining low-dose atropine concentration with orthokeratology resulted in greater myopia control effect compared to using orthokeratology therapy alone.[116,117] The articles describe the combined effect in different ways. The potential mechanism for the combined effect of atropine treatment and orthokeratology lenses is the increased retinal illumination resulting from a larger pupil diameter, which can influence the myopic shift in the peripheral retina and enhance the effect of ortho-K lenses. Moreover, a small but significant increase in pupil diameter leads to higher levels of high-order aberrations, and the elevated aberrations may provide a visual signal that slows eye growth, or the increased choroidal thickness may retard effective eye elongation.[118]
There are studies suggesting that Defocus Incorporated Multiple Segments (DIMS) technology combined with 0.01% atropine is more effective than DIMS lenses alone.[119,6] However the addition of 0.01% atropine to soft multifocal contact lenses with +2.50-D add powers did not result in a better myopia control than the lenses alone.[120]

13. Myopia generally progresses most rapidly during the preteen years (6–12 years).[121,62] By the age of 15 years, progression occurs in 52% of cases; by the age of 18 years, it can occur in 23% of cases. At the age of 21–24 years, myopia usually stabilises, except in those with high myopia.[62,122,123] Myopia can also occur between the ages of 20 and 30 years, which is a complex process involving a combination of genetic and environmental factors.[15,124]
Stabilisation is achieved when axial length progression is equal to or less than 0.06 mm per year.[124,125] However, it is important to note that axial elongation is age dependent. [55,126]
It has been demonstrated that discontinuing the use of ortho-K lenses before the age of 14 years causes axial elongation to accelerate. This indicates that wearing ortho-K should not be discontinued before the age of 14 years or possibly beyond.[127] After cessation of atropine therapy, axial length follow up is needed for an additional 6 to 12 months or longer to ensure there is no rebound effect.[113] Low-dose (0.05%, 0.1%) atropine therapy's effects

have been shown to last up to 4.5 years, and the rebound effect may also be less severe in older age after long-term use.[128]

Novel methods in myopia management

Current investigations have demonstrated that repeated Low-Level-Red-Light (LLRL) therapy could effectively slow down the progression of myopia.[129-135] The therapy utilizes desktop laser diode devices that emit long-wavelength light (635–650 nm). The follow-up period in current trials has extended up to 2 years.[132] The treatment effects reported were significant, surpassing those observed with other pharmacologic and optical interventions in terms of magnitude. Furthermore, the LLRL treatment resulted in thickening of the choroid.[132,134] Nevertheless, the exact mechanism behind the shrinkage of the axial length remains uncertain and cannot be attributed to changes in choroidal thickness alone. Discontinuation of LLRL therapy showed only modest rebound effects.[132,135] To date adverse event monitoring has primarily relied on questionnaires,[132] measures of best-corrected visual acuity, and limited utilization of optical coherence tomography (OCT) imaging.[129,134] This therapy requires further investigation to better understand its effectiveness, underlying mechanisms, and potential long- and short-term adverse events. The latter are particularly important since a recent case report demonstrates an example of possible retinal damage associated with this type of therapy.[136]

Conclusions: The role of eye care providers is multi-faceted in ensuring the best available therapy that corresponds to the specific requirements of myopic and pre-myopic children. The proposed algorithm reflects real-life experience that show there is no one method that works for everyone and that myopia management should be tailored to the individual child. The use of axial length growth curve charts and an analysis of family and environmental risk factors can help make well-informed decisions about myopia management and pre-myopic lifestyle advice to delay the onset of myopia. It is important to monitor patients regularly to determine whether the treatment they are receiving is working. If one strategy is not sufficiently effective, a change or combination with another intervention can be considered. By taking these factors into account, we can ensure that we are providing the most effective and personalized management approach for individuals with myopia. The area of myopia management is subject to tremendous research and clinical focus and new evidence, therapies and management options are emerging rapidly. Eye care practitioners have a responsibility to keep up-to-date, respond to the dynamic evidence-base, and ensure their practice continues to provide optimal care for patients.

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