



Communication between the Eye Care Practitioner and Parents of the Myopic Child

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Abstract

This article is based on a poster presented at the International Myopia Conference which took place in Rotterdam, Holland in August 2022. The poster and the article were both self-funded. Due to lack of space on the poster not all possibilities were noted therefore only some were chosen. In a follow-up article I will investigate other options available on the market. I have no financial interest in any of the products mentioned in this article. My main objective is to give the eye care practitioner a set of tools to help him illustrate to the parents the reason why their child's myopia should be treated, and not only corrected, and the importance of trying to slow its progression.

Keywords

Myopic; Eye Care Practitioners; Children; Spectacle Lenses

Introduction

By 2050, it is estimated that half the world's population will be myopic, with nearly one billion at risk of sight-threatening pathology [1]. Uncorrected distance refractive error is the second largest cause of blindness and the leading cause of moderate and severe vision impairment (53%) [2]. The dangers of myopia progression are the development of glaucoma, cataract, retinal detachment, and myopic maculopathy. These are sight threatening complications [3].

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Eye Care Practitioners (ECP), need to explain to the parents of the myopic children what might happen to their children's vision if not treated. This must be done very carefully, without frightening the parents. It is important to explain that "each dioptre matters". ECPs must not look at the short-term benefits, i.e., only correcting the refractive error, but consider the long-term visual health of their patients. The lower the level of myopia the less the risk of visual impairment [4]. Bullimore and Brennan (2019) stated that "a 1-dioptre increase in myopia is associated with a 67% increase in the prevalence of myopic maculopathy" or in other words "slowing myopia by 1 dioptre should reduce the likelihood of a patient developing myopic maculopathy by 40%" [4].

The important fact to remember is that whatever is said to the parents must be evidence based. Evidence-based medicine has become the "gold standard" for medical practice over the past 20 years [5-7]. It must be considered that they will check what has been said in the conversation concerning their child's refractive situation and they will not be convinced until they have cross-checked everything said.

According to the IMI white papers myopia is defined as "a refractive error in which rays of light entering the eye parallel to the optic axis are brought to focus in front of the retina when ocular accommodation is relaxed. It is also called nearsightedness" [8].

The parents of the myopic child need to be convinced that their child's myopia has the potential of progressing and concrete examples of how the myopia may progress and what might happen when it progresses.

To demonstrate this there are various myopia calculators, indicators, progression charts and evidence-based markers which will be explained in detail.

There is an evidence-based risk indicator which eye care practitioners can use namely Predicting Myopia Onset and progression (PreMo). This risk indicator can stratify the child's risk for developing myopia. This indicator provides advice and guidance for the parents and their children on the likelihood of future myopia as well as a structure with which to discuss ways to delay onset. This is the first part of the indicator (Fig. 1-3). One of the advantages of the indicator is that it can be used in conjunction with professional judgement to select evidence-based management options. This is the second part of the indicator. The preMo Indicator has been developed primarily from the NICER Study research. The Northern Ireland Childhood Errors of Refraction (NICER) study is the largest study in the UK and Ireland to examine how children's vision, in particular their refractive error (i.e., how long- or short-sighted they are) changes through childhood and adolescence (Fig. 4,5) [9-18].

6-8-Year-Old Children

Table 1a: Assessing risk of myopia development			
Risk factor for myopia development			Score assigned
Genetic	1. Parental myopia	Neither parent myopic	0
		One parent myopic	2
		Two parents myopic	3
Refractive	2. Cycloplegic SER *	Greater than +1.00D	0
		+0.75D to +1.00D	2
		Less than +0.75D	3
	3. Axial Length **	Less than 22.93mm	0
		22.94mm to 23.11mm	1
		23.12mm to 23.18mm	2
		23.19 mm or greater	3
Risk Score (0-9)			

*If cycloplegic SER is not available use these non-cycloplegic estimations for risk scores ²	
Non cycloplegic SER (D)	
Greater than +0.75	0
+0.325 to +0.75	2
Less than +0.325	3

**If axial length is unavailable, use these estimations for risk score from average K (mm) & SER (D)					
	Cycloplegic SER (D)				
	-0.25	0.00 or +0.25	+0.50 or +0.75	+1.00 or +1.25	+1.50 or +1.75
K(mm)					
7.4 or less	0	0	0	0	0
7.5	1	0	0	0	0
7.6	3	2	1	0	0
7.7	3	3	2	1	0
7.8	3	3	3	2	1
7.9	3	3	3	3	2
8.0 or greater	3	3	3	3	3

Figure 1: Part 1 of PreMo indicator.

9-10-Year-Old Children

Table 1b: Assessing risk of myopia development			
Risk factor for myopia development			Score assigned
Genetic	1. Parental myopia	Neither parent myopic	0
		One parent myopic	1
		Two parents myopic	2
Refractive	2. Cycloplegic SER *	Greater than +0.875D	0
		+0.375D to +0.875D	1
		Less than +0.375D	2
	3. Axial Length **	Less than 23.33mm	0
		23.33mm to 23.61mm	1
		23.62 mm or greater	2
	Risk Score (0-6)		

* If cycloplegic SER is not available use these non-cycloplegic estimations for risk scores ²	
Non cycloplegic SER (D)	
Greater than +0.625	0
+0.125 to +0.625	1
Less than +0.125	2

** If axial length is unavailable, use these estimations for risk score from average K (mm) & SER (D)					
K(mm)	Cycloplegic SER (D)				
	-0.25	0.00 or +0.25	+0.50 or +0.75	+1.00 or +1.25	+1.50 or +1.75
7.6 or less	0	0	0	0	0
7.7	1	1	0	0	0
7.8	2	1	1	0	0
7.9	2	2	1	1	0
8.0	2	2	2	1	1
8.1	2	2	2	2	1
8.2 or greater	2	2	2	2	2

* Result of autorefraction (or retinoscopy) >20 minutes after instillation of 1% Cyclopentolate HCl. Use the result from the least hyperopic eye/most emmetropic eye.

Use the conversion table for non-cycloplegic subjective refraction results if cycloplegic refraction values are not available. Cycloplegic refraction is encouraged to determine the risk score more accurately.

** If you do not have access to axial length measures use the conversion table to estimate the axial length risk score based on SER (D) and mean anterior corneal radius of curvature (K, mm).

Figure 2: Part 1 of PreMo indicator.

Interpreting the Risk Score

Evidence-Informed Management				
Use the 'Risk Score' calculated in Table 1a or 1b to indicate the child's risk of becoming myopic, the age at which myopia is likely to develop and the suggested recall schedule and management advice from Table 1c.				
RE-TEST INTERVAL: The suggested recall for patients at moderate to high risk of developing myopia by 10 or 13 years of age is one year until at least 13 years of age ^{1,4} in the absence of emergent signs/symptoms, significant existing astigmatism and/or anisometropia or a pre-existing binocular vision anomaly.				
ADVICE: All patients who are 'at risk' of myopia development (Risk Score ≥1) should receive evidence-informed environmental and lifestyle advice including promoting spending increased time outdoors (>40 mins per day) and decreasing time spent on near activities e.g. smart phones and computers.				
The higher the score, the higher the risk of future myopia and of myopia occurring at an earlier age. Earlier onset is likely to result in higher magnitudes of myopia long-term. ² This information can be relayed to parents to highlight their child's relative risk and stress the importance of regular eye examinations and adherence to environmental and lifestyle advice.				

Table 1c: Predicted risk of myopia development and suggested management and advice				
Score	Risk of myopia development	Predicted refractive outcome	Management Suggested recall †	Advice
0	LITTLE/NO RISK	Likely to remain emmetropic	2 years	Little/No risk of myopia development
1-3	LOW RISK	Likely to be myopic by 16 years	1 year	Environment & lifestyle modifications‡
4-6	MODERATE RISK	Likely to be myopic by 13 years		
7-9	HIGH RISK	Likely to be myopic by 10 years		

† In the absence of emergent signs or symptoms during recall period or presence of significant refractive error (hyperopia, anisometropia or astigmatism) or binocular vision anomaly.
‡ With advice on implementation of environmental modifications and lifestyle advice (e.g. increasing time spent outdoors >40 mins per day, decreasing time spent on near activities e.g. smart phones and computers)²

Figure 3: Part 1 of PreMo Indicator.

To determine an evidence-based management and recall schedule for myopic children you will need:

1.) Cycloplegic SER result from two or more successive eye examinations 2.) An estimate of annual progression in SER

Annual progression of SER can be calculated using the following formula: Annual Progression (D) = SER2-SER1/Years between tests

Table 2a: Myopia management and suggested recall schedule			
Risk of myopic progression			Score assigned
Demographic	1. Age of child	13 years old or more	0
		Less than 13 years old	1
Refractive	2. Annual progression in SER (D)	Less than 0.50D	0
		0.50D or more	1
		Risk Score (0-2)	

Evidence-Informed Management

Use the 'Risk Score' calculated in Table 2a to indicate the child's risk of myopic progression and the suggested recall schedule and management advice from Table 2b.

RE-TEST INTERVAL: The suggested recall for patients at risk of myopic progression is one year until at least 13 years of age in the absence of emergent signs/symptoms, significant existing astigmatism and/or anisometropia or a pre-existing binocular vision anomaly. If the child is less than 13 years of age and has shown an annual myopic progression of >0.50D, they are at risk of fast myopic progression and should be reviewed in six months. Table 2a can be used at subsequent review to re-evaluate the future risk of progression.

ADVICE: The optometrist should discuss myopia control strategies with patients who are at moderate to high risk of myopia progression (score 1 or 2).**

Where the risk of myopia progression is identified as 'Little/No Risk', this should be considered in the context of the child's current environment/lifestyle. Risk of progression should be re-evaluated at subsequent review.

Figure 4: PreMo part 2.

Table 2b: Predicted risk of myopia progression and suggested management and advice				
Score	Risk of myopia progression & predicted refractive outcome		Management	Advice
			Suggested recall *	
0	LITTLE/NO RISK	Stable/Slow progression of myopia Low magnitude of myopia long-term	2 years	Low risk of myopic progression
1	MODERATE RISK	Moderate progression of myopia Moderate magnitude of myopia long-term	1 year	Discuss myopia control strategies **
2	HIGH RISK	Fast progression of myopia High magnitude of myopia long-term	6 months	

Figure 5: PreMo part 2.

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Another means of illustrating to the parents the child's myopia progression is by using the myopia calculator developed by the Brien Holden Vision Institute. This is an online tool which enables the ECP to show the beneficial effect of slowing myopia progression using the technologies available. ECPs can input the patient's age, ethnicity, and level of refractive error when treatment began plus the treatment selected. The result shows in an illustrative form the treatment effect and what may happen if untreated (Fig. 6) [19].

When explaining in an illustrative form the picture is much more convincing.



Figure 6: The BHVI myopia calculator.

In an article written by Chua, et al., in a study conducted in China, they found that the age of onset of myopia predicts risk of high myopia in later childhood in myopic children.

The following chart shows the yearly changes in dioptres of myopic children between 7 and 11 years of age relative to the age of myopia onset (Fig. 7).

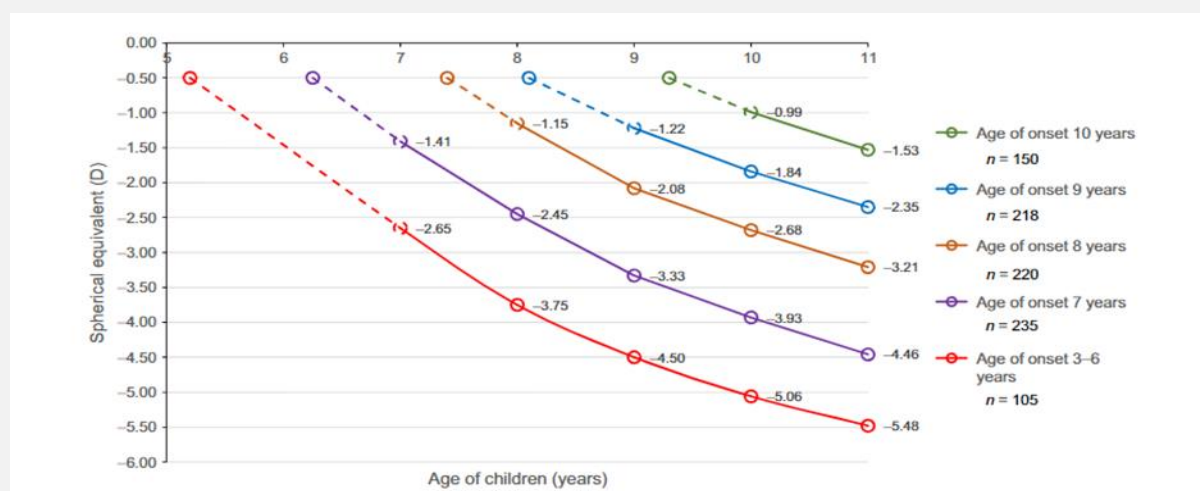


Figure 7: Yearly changes in spherical equivalent (D) of myopic children from age 7-11 years, stratified by age of myopia onset (n=928) D, dioptres.

Finally, explain to the parents the treatment options available for myopia management these being:

1. Orthokeratology
2. Soft Contact Lenses:
 - a) MiSight by Coopervision
 - b) Centre-Distance Multifocals
 - c) Extended Depth of Focus (Mylo)
 - d) NaturalVue Multifocals

The above are the more well-known products on the market today, for myopia management. This is also dependent on where you are practicing because some products are available in some countries whereas others are not. The same goes for the spectacle lenses, on the market, for myopia management. The following spectacle lenses referred to in this article are those with evidence-based data over a period of 2 years or more.

3. Spectacle Lenses for myopia management:
 - a) MyoSmart by Hoya [21]
 - b) Stellest by Essilor [22]
 - c) DOT by SightGlass [23] (The lenses mentioned here are those with evidence-based results of 2 or more years)
4. Atropine [24-27]

After discussing the pros and cons of each intervention the final decision of which treatment options to use will be a combined decision between the ECP, parents and child.

Conflict of Interest

The author did not report any potential conflicts of interest in research, authorship and/or publication of this article.

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