The current/forthcoming global myopia epidemic and prevention thereof has been well documented by this publication and the wider optical press. The area of myopia control is moving from a niche speciality to a more mainstream offering. Lectures and practicals specific to myopia control are occupying increasing numbers of hours in undergraduate training. Each eyecare professional must decide if (s)he wants to become involved in actively offering myopia control strategies, or if (s)he is content to simply provide parents and patients with information and referral to a suitable colleague.

This article outlines the responsibilities of eyecare professionals with respect to myopia control, how to identify those at risk of progressive myopia, how to gain informed consent from parents and assent from patients, and soft contact lens options for myopia control.

PROFESSIONAL RESPONSIBILITIES
General Optical Council (GOC) registered eyecare professionals (ECPs) are obliged to meet two Standards of Practice competencies, which are relevant to myopia control. They are:

2.5.3 Be aware of current good practice, taking into account relevant developments in clinical research, and apply this to the care you provide.

And

2.1.6 Consider all information provided by your patients, including where they have undertaken research in advance of the consultation. Explain clearly if the information is not valid or relevant.

To meet the first competency, ECPs should have at least some knowledge of the current research in the area of myopia control. Patients and parents should be warned about the risk of children developing progressive myopia and subsequent myopic comorbidities, for example, glaucoma and retinal detachment.

To meet the second competency, ECPs should also be aware of strategies which have been determined inadequate in terms of myopia control, specifically that the undercorrection of myopia does not prevent progression and has actually been shown to accelerate it1.

IDENTIFYING THOSE AT RISK
Several factors need to be considered when attempting to identify those at risk of myopic progression. A study from 2000 reported the percentage of myopia in Taiwanese 15-year-olds as 81 per cent2. The Northern Ireland Childhood Errors of Refraction (NICER) study found that children who were ≤+0.50D at age eight were more likely to become myopic. It also showed that nearly one in five teenagers in Northern Ireland were now myopic3. A study from the United States determined a similar risk for any child who was ≤+0.75D at age six to seven4.

It is unlikely that most ECPs would consider myopia control strategies for young children with low hyperopia and emmetropia, but these results suggest that these types of patient should be monitored closely, particularly if they have more than one risk factor for myopia development.

Myopia control with soft contact lenses
By Claire Mc Donnell MSc FAOI

Any myope under the age of 16 is a candidate for myopia control

This article has been approved for 1 CET point by the GOC. It is open to all FBDO members, and associate member optometrists. The multiple-choice questions (MCQs) for this month’s CET are available online only, to comply with the GOC’s Good Practice Guidance for this type of CET. Insert your answers to the six MCQs online at www.abdo.org.uk. After log-in, go to ‘CET Online’. Questions will be presented in random order. Please ensure that your email address and GOC number are up-to-date. The pass mark is 60 per cent. The answers will appear in the August 2018 issue of Dispensing Optics. The closing date is 13 July 2018.
The NICER study also found that children with one myopic parent were 2.91 times more likely to develop myopia than those with no myopic parents and children with two myopic parents were 7.79 times more likely\(^3\), so a careful note of family history of refractive error should be made, where known.

A ‘clinical myopia profile’ has been developed by Kate Gifford, a well-known clinical optometrist, lecturer and researcher based in Brisbane, Australia. This profile is available from her website – www.myopiaprofile.com\(^4\) – and it can help practitioners to understand and evaluate an individual child’s risk of developing myopia.

In order to determine the risk of progressive myopia and the likelihood of success of various myopia control strategies, it can also be useful to examine certain aspects of a child’s binocular vision status. Children with a near esophoria of \(\pm 2\) are more at risk and tend to respond better to myopia control strategies, compared to children with near orthophoria or exophoria\(^6\). Accommodative lag may be associated with myopia progression\(^7\)\(^-11\). Accommodative lag is when the amount by which the eye accommodates, to focus an object at a given distance, is less than the amount of accommodation that would be assumed to be required for that distance (e.g. an eye should accommodate by \(+2.00\)D to view an object half a metre away but the eye may only actually accommodate by \(+1.50\)D showing a ‘lag’ of \(+0.50\)D). The normal range for accommodative lag is generally considered to be between \(+0.50\)D and \(+1.00\)D. Pre and progressing myopes may have lags that are higher than the normal range. However, it should be noted that the research into accommodative lag and myopia progression is unfortunately equivocal, with some studies showing no association\(^12\)\(^-13\).

Because the myopic eye’s axial length continues to grow until the age of approximately 16\(^14\), it may be argued that any myopia that develops prior to this age is likely to progress somewhat and, therefore, that any myope under the age of 16 is a candidate for myopia control.

Ideally, strategies should be commenced on patients as young as possible, in order to gain the maximum effect. Any child who develops myopia at or under the age of 12 is highly likely to be a progressive myope. Some ECPs prefer to see a child six months after their initial myopic prescription to confirm that the myopia is progressing, before deciding to initiate myopia control. In young myopes with a positive family history, this approach may be overly conservative. Parents and patients should be advised that any myopia control strategy needs to be continued until the child is at least 17 years of age (i.e. until the axial length is fully grown).

Early cessation of a myopia control strategy may result in a rebound effect\(^15\) where previously controlled myopia may suddenly accelerate. A 2014 study from Finland\(^16\) has shown that some myopes will continue to progress even into their early 20s and therefore some patients may have to continue myopia control beyond 17 years of age. Once a patient ceases a particular strategy, they should be checked after six months to ensure that their myopia has not increased since cessation and, if it has, consideration should be given to the reinstigation of myopia control.

**GAINING INFORMED CONSENT**

Assuming that it has been established that a child is at risk of progressive myopia, then several steps need to be taken before considering commencing any myopia control strategy. The parents need to be given detailed information as to what progressive myopia is and why it needs to be controlled (i.e. the risks of myopia comorbidities). They should also be given information about all the various options available to control myopia, including options not necessarily offered by the child’s practice.

Having had time to digest this information and to come to a decision regarding a strategy, the parents then need to be given a consent form prior to the commencement of any strategy. A consent form for soft contact lens wear should cover all of the following:

- The fact that it cannot be definitively stated that the child’s myopia will progress, only that the child is at risk of progression.
- The increased risk of various eye diseases that comes with myopia development.
- The fact that not all eyes respond to myopia control and it is possible that the chosen strategy will not mitigate the child’s myopia development.
- Any myopia control strategy should continue until the child is at least 17 years of age.
- The minimum wearing time required should be stated.
- The fact that all contact lens wear carries the risk of sight-threatening infection (but this risk should be weighed up against the risk of sight loss from eye disease secondary to myopia).
- The child must also have an up-to-date pair of spectacles.
- Initial and ongoing costs should be detailed.

Apart from obtaining parental consent, an ECP will also need the assent of the child to fit contact lenses. This means that the child must agree to be fitted. A contact lens should never be put in the eye of any child who is obviously uncomfortable with the process, irrespective of the parents’ wishes.

Because the majority of myopia control strategies will only slow the progression of myopia and will not stop it completely, it can be difficult for both the practitioner...
and parents to gauge how successful the strategy is. The Brien Holden Vision Institute have developed a free online myopia calculator, which is available at https://calculator.brieholdenvision.org/ (Figure 1). This calculator allows the ECP to input the child’s age, their current refractive error (spherical equivalent only) and the preferred myopia management option (e.g., multifocal soft contact lenses, orthokeratology, low dose atropine, etc.).

Once the information has been input, the calculator then gives a percentage reduction in progression of myopia when compared to if the child had just been corrected with standard single vision spectacles. The calculator also estimates what the child’s refractive error will be at age 17 if they are managed with the preferred myopia control option, and what it will be at age 17 if they are not managed.

The figures displayed are all based on peer-reviewed research. The calculator is very easy for parents to understand with only a small amount of explanation from the ECP. The same graph can also be used to track where a patient’s myopia should be at any given age (between six and 17) and can therefore be used as a rough measurement of how successful the strategy is for any given patient.

SOFT CONTACT LENS OPTIONS

Soft multifocal contact lenses have been shown to be effective when used for myopia control. The theory is that a centre-distance multifocal lens would allow the patient clear, corrected, central vision while the reading addition in the periphery would reduce the hyperopic defocus on the retinal fovea, thus reducing the growth of the axial length of the eye and retarding the progression of myopia. In fact, a recent study in the United States found that even a centre near multifocal lens helped to control myopia—but the obvious advantage of a centre distance lens was the clear central vision.

Until 2017 there was no contact lens available in the UK that was specifically licensed for myopia control. ECPs were instead prescribing centre-distance multifocal lenses designed to treat presbyopia, in an off-label use, to try to effect myopia control. Off-label use is a legitimate use of any medical device, but if a practitioner is challenged about their decision to use a product off-label, they must be able to point to robust scientific research that supports their decision.

Multifocal contact lenses for presbyopia can provide different reading addition powers and it was thought that the higher the addition, the less the hyperopic defocus (or the more the myopic defocus) and therefore the greater the control of myopia. A 2013 study by Bickle showed that objectively and subjectively there did not appear to be a significant difference in visual acuity, contrast sensitivity and perception of glare and starbursts between wearing a single vision lens and a multifocal lens with a +2.00D addition. Lenses with +3.00D and +4.00D additions showed worse low contrast visual acuity and when children wore the higher additions, they were more likely to complain of glare, starbursts and difficulty changing focus from distance to near and vice versa. For this reason, it is normally advised to use an addition of +2.00D or +2.50D when using multifocal lenses for myopia control.

In 2017 CooperVision launched the MiSight contact lens, which was the first soft contact lens available in the UK that was licensed for myopia control. The lens is a dual-focus lens that consists of a central distance correction with two concentric rings with a reading addition of +2.00D. The lens is a hydrogel daily disposable, made from the same material as Proclear daily disposable. CooperVision recommends that a child wear the lens for a minimum of 10 hours a day, six days a week, in order to obtain the optimum control of myopia development. During the clinical trial of these lenses, it was noted that 30 pairs of lenses often did not last 30 days as some lenses were lost/dropped and sometimes lenses would have to be changed during the day in the case of, for example, swimming. Parents should be warned that they may have to purchase more than 30 pairs of lenses, in order for some children to complete a full month of wear.

The MiSight lens is only available in spherical prescriptions and CooperVision advises that children with cylinder corrections >0.75DC should have their astigmatism corrected by spectacles worn over the contact lenses.

Because of the peripheral treatment zone, children may notice some peripheral blur or ghosting with myopia control lenses. This has been reported to be more frequent with reading. The ghosting tends to only be noticed for a few days and then the children adapt to it. Younger children are less likely to complain of peripheral blur than teenagers.

Ideally, myopia control strategies should commence when the child is between the ages of six and 11. The age at which a child can initially be fitted with contact lenses (that they will apply, remove and care for themselves) depends on the child and the parents. Children as young as four have been fitted with contact lenses for myopia control, but the parents would normally do the application and removal. Some six year olds can apply and remove lenses themselves and most children would be capable of this by the age of eight. Research has shown that contact lens related cornel infiltrative events are no more likely in children than they are in adults and that in the age range of eight to eleven year olds, the incidence is actually much lower.

Ideally a parent would attend every appointment with the child. It is useful for a parent to attend the teach so that they can help their child with lens application and removal if necessary (or carry it out themselves on children that are very young). Children should be given ample time for the teach appointment(s). They should not feel rushed or under pressure. They should not be given lenses to wear until the practitioner is satisfied that they are fully competent in application and removal.

Parents should be educated as to the do’s and don’ts of contact lens wear. In particular, parents need to know that if the child shows any abnormal signs or complaints of abnormal symptoms, then contact lens wear must cease immediately and the child must be brought to an ECP.
Teenagers may be more likely to have poor hygiene than younger children and therefore when going through compliance with a teenager, it would be wise to confirm (in writing if necessary) that they understand all the steps involved in the care of contact lenses. The child should have a full eye examination including a cycloplegic refraction and measurement of the pupil under low illumination. (Children with pupil diameters of 4 mm may not gain the full benefit from the treatment zone of the lens21.) Assessment of binocular vision status should include measurement of any near phoria and measurement of the accommodative lag. Over-refractions should be carried out with trial frames and/or flippers, as a phoropter may cause pupil dilation which may increase the perception of peripheral blur. The vision should be checked binocularly to determine if this helps to reduce blur. Excessive decentration of the lens is likely to adversely affect the vision.

The wearing time of the contact lens can be built up quite quickly after the initial fitting, i.e. two hours the first day, with an increase of two hours a day thereafter, up to 10 hours in a day. The child should return after approximately a week of full-time contact lens wear and every six months thereafter. They should have annual eye examinations. In most cases, it will not be necessary to carry out a cycloplegic refraction each time.

For patients who cannot wear contact lenses full-time, it may be possible to prescribe large segment bifocals or varifocal spectacles to be worn at times when the contact lenses cannot. Patients showing signs of hypoxia (e.g. limbal hyperaemia) may have to be changed from licensed hydrogel lenses to off-label silicone hydrogel lenses. Fitting children with soft contact lenses for myopia control has been shown to be effective and should be no more difficult than fitting an adult with a multifocal lens for presbyopia. ECPs cannot ignore the progression of a child’s myopia and they have a professional obligation to inform parents that there are now valid strategies available to control myopia. It is for each ECP to decide for themselves if they want to offer any of these myopia control strategies in their own practice, or if they prefer to refer progressing myopes to a competent colleague.

ACKNOWLEDGEMENTS
The author would like to acknowledge the help of Dublin Institute of Technology colleagues, Saoirse Mc Crann and Michael Moore, in preparing this article.

REFERENCES

FURTHER RESOURCES
*Misight* contact lens information can be found at https://coopervision.com.my/contact-lenses/misight

CLAIRE MC DONNELL FAOI is an optometrist and lecturer in the Department of Optometry at the Dublin Institute of Technology with a special interest in contact lenses and teaching. She has an MSc in applied e-learning and has authored numerous CET articles and delivered many CET presentations in Ireland, the UK and Europe. She is also a member of the British and Irish University and College Contact Lens.