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ORIGINAL ARTICLE

2024 UK and Ireland modified Delphi consensus on myopia management in children and young people

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Abstract

Introduction: This work aimed to establish the largest UK and Ireland consensus on myopia management in children and young people (CYP).

Methods: A modified Delphi consensus was conducted with a panel of 34 optometrists and ophthalmologists with expertise in myopia management.

Results: Two rounds of voting took place and 131 statements were agreed, including that interventions should be discussed with parents/carers of all CYP who develop myopia before the age of 13 years, a recommendation for interventions to be publicly funded for those at risk of fast progression and high myopia, that intervention selection should take into account the CYP's hobbies and lifestyle and that additional training for eye care professionals should be available from non-commercial sources. Topics for which published evidence is limited or lacking were areas of weaker or no consensus. Modern myopia management contact and spectacles are suitable first-line treatments. The role and provision of low-concentration atropine needs to be reviewed once marketing authorisations and funding decisions are in place. There is some evidence that a combination of low-concentration atropine with an optical intervention can have an additive effect; further research is needed. Once an intervention is started, best practice is to monitor non-cycloplegic axial length 6 monthly.

Conclusion: Research is needed to identify those at risk of progression, the long-term effectiveness of individual and combined interventions, and when to discontinue treatment when myopia has stabilised. As further evidence

For affiliations refer to page 21.

continues to emerge, this consensus work will be repeated to ensure it remains relevant.

KEYWORDS
adolescent, child, Delphi, myopia, myopia management

INTRODUCTION

Several myopia management interventions for children and young people (CYP) are now available in the UK and Ireland. In randomised controlled trials, these treatments reduced myopia progression by a relatively significant amount compared to their control arms[1] and some data suggest that combination optical/pharmacological treatments may potentially provide an enhanced effect.[2–7] At present, in the UK and Ireland, no clinical intervention is publicly funded. As myopia treatment costs may disproportionately affect CYP of ethnic minority and lower socioeconomic backgrounds,[8,9] this could cause inequity of access and healthcare inequality. In addition, eye care professionals (ECPs), parents/caregivers and the young person themselves may struggle to decide which option is best, particularly as new technologies enter the market at a rapid pace. The quality of efficacy and safety data supporting the implementation of these technologies depend on duration, size and type of trials undertaken. Clinical trials often have restrictive inclusion criteria, typically enrolling young people 8–13 years of age, that is, those where the effect size will be greatest, while excluding those with high myopia and other ocular conditions. In addition, trials are limited to reporting short/medium-term outcomes. Many real-world implementation questions, therefore, remain unanswered. An increasing number of systematic reviews, meta-analyses and international recommendations intend to bridge the gap to clinical practice,[1,10,11] but areas of uncertainty remain, and differing recommendations, which often cannot be implemented at a local level, may create confusion.[12]

Given the increasing prevalence of myopia in CYP in the UK over the past 50 years (the current prevalence is 14.6% and 16.4% of 12–13 and 17-year-olds, respectively)[13] and with 25%–30% of young adults now affected across Western Europe,[14] myopia-related complications are an increasing public health concern. Over the past 10 years, the number of retinal detachment repair operations has increased in England and Scotland.[15,16] According to the National Institute for Health and Care Excellence (NICE), 200,000 people in the UK have pathological myopia; of those with myopic maculopathy in one eye, 30% will also become affected in the fellow eye within 8 years.[17,18] Complications associated with myopia often affect people of working age, causing severe impact on the quality of life and ability to earn a living, as well as having a significant bearing on health and social care. Agreeing strategies to reduce the final level of myopia is timely, as it is estimated that every dioptre reduction will reduce the relative risk of myopic maculopathy by 40%.[19] In addition, the progression of myopia is linked with anxiety/depression and reduced quality of life.[20–22]

Key points

- Myopia management interventions should be offered to children at risk of progression.
- The child's or young person's lifestyle and hobbies should be considered when selecting the most appropriate intervention. Adherence to prescribed interventions is important.
- Future public funding is advocated, as cost may be a deciding factor for some families.

To formulate recommendations on clinical myopia management best practices in the UK and Ireland, a multidisciplinary panel with academic and/or practical myopia management expertise was convened. The Delphi method was adopted, which is widely used to achieve expert consensus in healthcare, particularly where high-quality evidence is incomplete or unobtainable.[23–25] Delphi studies have five characteristics: (1) knowledgeable experts form a panel; (2) surveys are conducted anonymously in at least two rounds of voting, (3) the survey instrument is usually a questionnaire with standardised responses, (4) the statistical analysis is usually descriptive and (5) at the start of new rounds, the panel is provided with feedback on the previous round and can reconsider or maintain their response.[25] Delphi panels range from homogenous single specialty experts to multidisciplinary panels with key stakeholders/service users.[23–25] The classic approach was modified here by holding a second panel meeting to discuss items that had not found agreement during two rounds of voting.

The expert panel of multidisciplinary ECPs and academics working in optometry and paediatric ophthalmology in the UK and Ireland aimed to critically consider evidence and experience to develop consensus on myopia management.

METHODS

Expert panel

Eye care professionals were recruited with clinical and/or academic expertise in myopia management from primary/secondary/tertiary eye care facilities. Specifically,

professionals invited to participate met at least two of the following criteria:

- Had prescribed myopia interventions to ≥50 CYP
- Had developed or contributed to a myopia management algorithm
- Active involvement in ≥5 myopia-related research projects
- Authorship on ≥5 myopia-related publications
- Co-lead or lead applicant on ≥5 myopia-related grant applications.

Existing myopia groups were approached (Myopia Consortium UK, myopiafocus.org, Global Myopia Awareness Coalition) to identify panellists and invite experts known within our professional networks. Potential panellists were asked to disseminate the invitation to others who met the inclusion criteria. Due to this broad approach to identify and invite experts, it is not possible to state how many experts were invited. However, a total of 34 experts joined the expert panel. With Research Ethics Approval from University College London (reference 7701/005), panellists completed an online survey of demographic characteristics, qualifications and myopia management experience.

Definition of consensus

A 5-point response scale was used (strongly agree/5, agree/4, neither agree nor disagree/3, disagree/2, strongly disagree/1), while a sixth option, 'don't know/don't want to answer' was reported but excluded from the summary analysis. Based on median and interquartile range (IQR), the strength of consensus was defined as follows:

• median 4 or 5 and IQR ⩽ 1:	strong consensus on agreement with statement,
• median 4 or 5 and IQR > 1 and ⩽2:	moderate consensus on agreement,
• median 1 or 2 and IQR ⩽ 1:	strong consensus on disagreement,
• median 1 or 2 and IQR > 1 and ⩽2:	moderate consensus on disagreement,
• median 1, 2, 4 or 5 and IQR > 2; OR • median 3 regardless of IQR:	no consensus.[23]

Rounds

The launch meeting in April 2023 discussed the proposed format (Figure 1), scope and topic areas. In four anonymous web-based survey rounds using commercial Delphi software, Welphi (welphi.com), topics and items were generated, refined and voted upon. A second meeting discussed items that had not reached consensus, followed by a final round of voting.

The first survey (2–9 May 2023) asked, 'Which topics and areas related to myopia and its management should we include in this consensus exercise, and why?'

The study team (ADN, NG, KW and AG) analysed the answers using thematic analysis,[26] until agreement was reached on the topics raised. Figure 2 shows a word cloud of the most common words included in the response to the first survey. Additionally, published literature[1,10,11] was used to develop draft items, and these were circulated to the panel.

The second survey (21 May to 4 June 2023) assessed statement phrasing and inclusion/exclusion of draft items. Based on the feedback, the study team rephrased/eliminated relevant items.

The final list of items was voted on in a third survey (June 15–27, 2023) and explored the level of agreement/disagreement. The study team rephrased selected items from the feedback received. Another round of voting (July 2–13, 2023) followed, with feedback from the previous vote visible to panellists. At a second meeting (July 18, 2023), items that had not reached consensus were discussed, rephrased and re-voted upon. At a third meeting (7 December 2023), the manuscript was discussed and amended as agreed during the meeting and reviewed by all authors.

Prevention of bias

All web-based survey rounds were anonymous. Panellists' conflicts of interest are listed in Table 1. An independent researcher (AG) co-ordinated the study and acted as moderator.

Processing and interpretation of results

Panellist's demographic/professional data were summarised using descriptive statistics. Data to generate topic areas were analysed using an open-access word cloud generator (wordle.net) showing words used with higher frequency in larger font size. From this, emergent themes were noted[27] and refined using thematic analysis and categorised in Microsoft Office Excel v16.77 (Microsoft.com). Voting responses were exported to SPSS v24 (ibm.com) to calculate the median and IQR. Using Excel, a radar chart was generated to visualise changes in IQR between voting rounds one and two.

RESULTS

Expert panel

Thirty-four experts across all UK nations and Ireland took part (Table 2). Thirty-one completed the panellist survey, including 25 optometrists (81%) and six ophthalmologists (19%); 16 (51%) were female. Mean time since

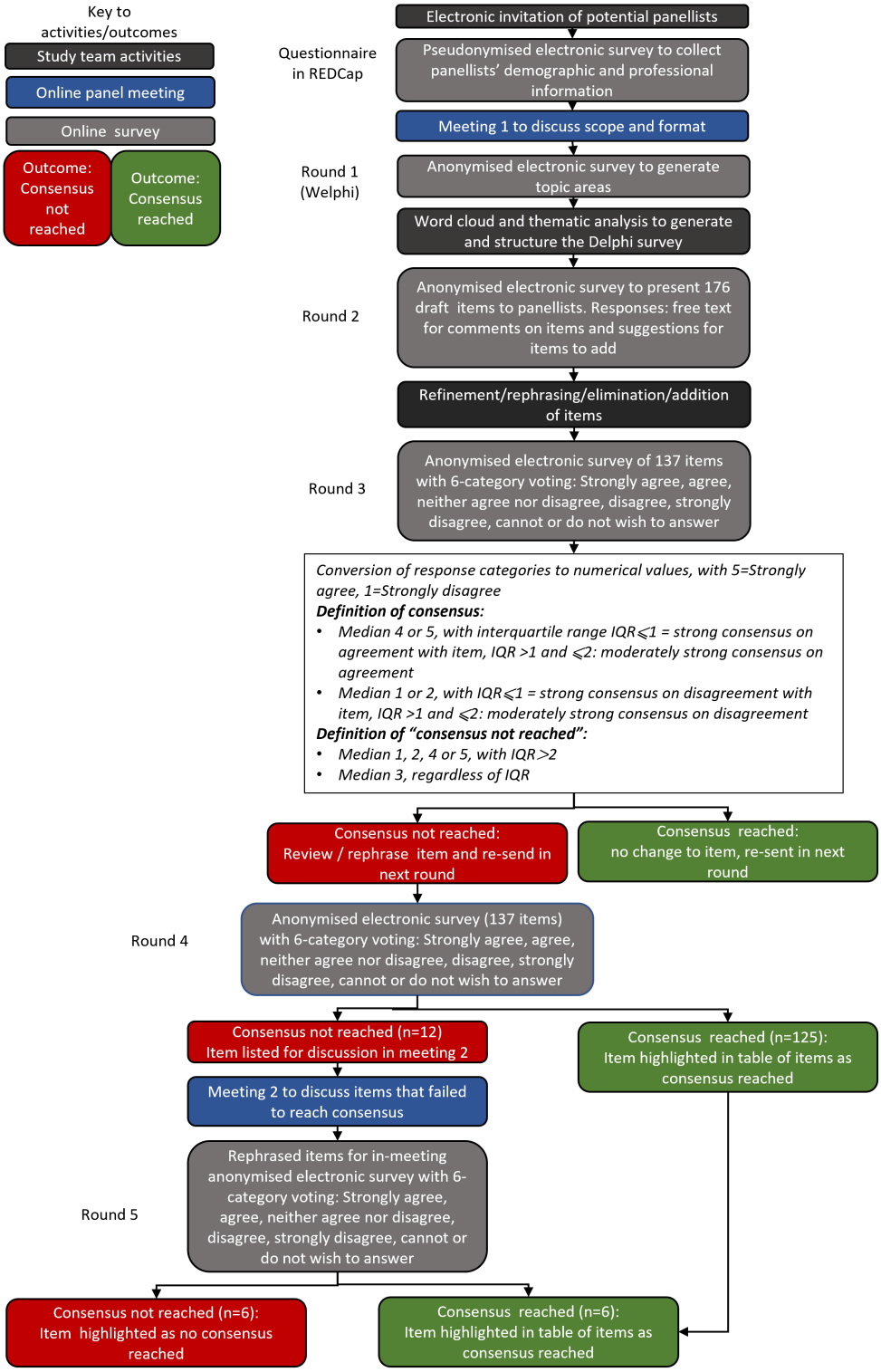

FIGURE 1 Flowchart showing the steps of the 2024 UK/Ireland Myopia Delphi Consensus.

primary qualification was 24 years (SD 8.8). Most ($n = 20$, 64%) worked in academia or research optometry clinics. Approximately half (48%) had offered myopia management in their practice to 11–100 children over the past 5 years; several (22%) are currently involved in myopia research.

Item generation

The first survey received 33 replies (response rate 97%). After removing header terms (myopia management, treatment, control, children, progression), the numerical free-text analysis showed that the most common areas of

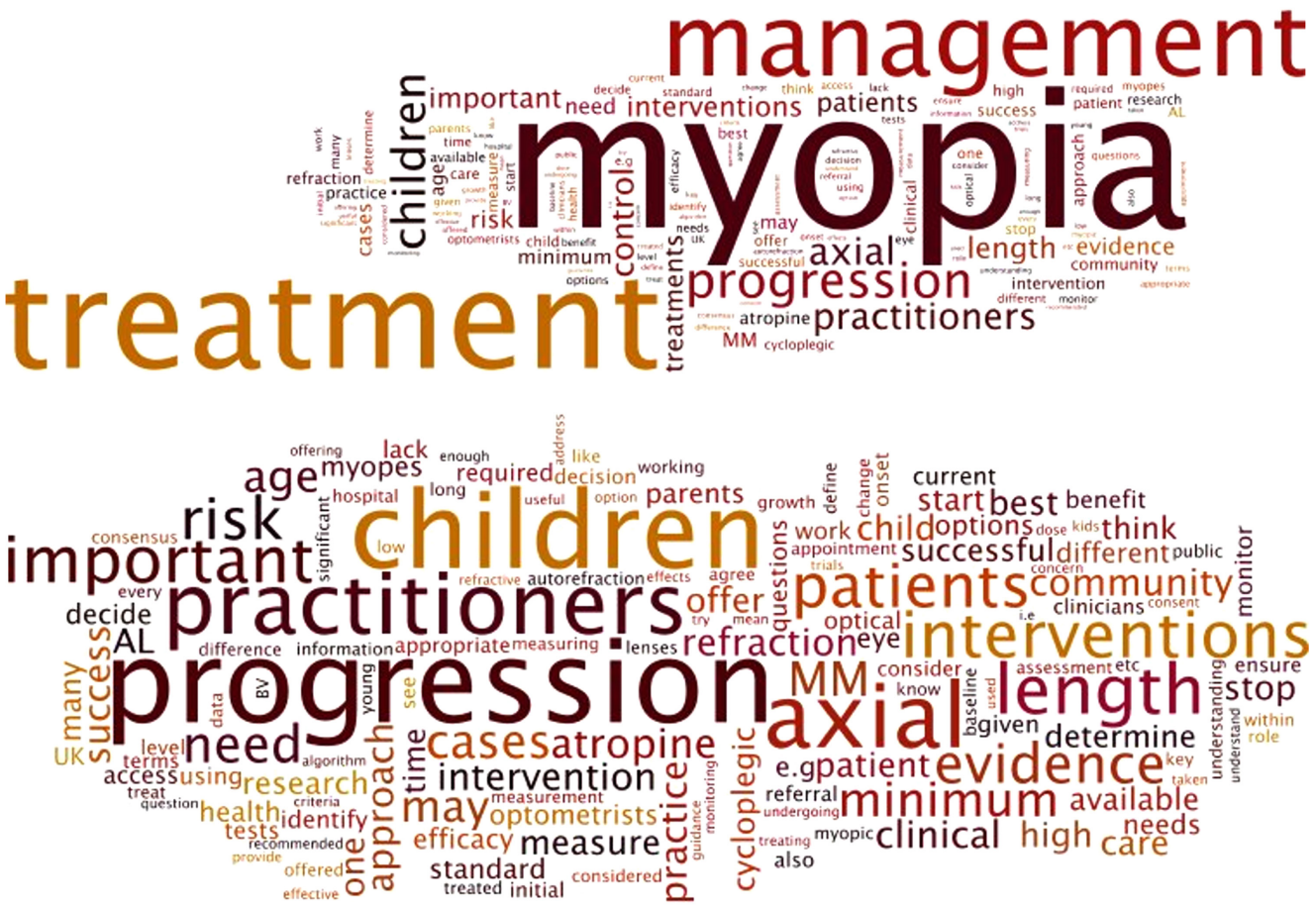

FIGURE 2 (a) Word cloud analysis of all free-text words in the topic-generation round. 'Myopia management/treatment/control' are main themes, but could also be considered header items. (b) Removal of these highlights 'progression, axial length, interventions, practitioners/children/patients, risk and evidence' as prominent areas.

interest were 'practitioners/children/patients, axial length (AL), interventions, evidence, risk' (Figure 2).

In the thematic analysis, items were identified and categorised into topic areas until saturation was reached; this resulted in 176 draft items which were circulated to the panel for comments.

In the second survey, 32 of 34 panellists (94%) provided feedback. Following removal/rephrasing, the final list included 137 items and these were moved forward into the first round of voting.

Voting rounds 1 and 2 and second and third meeting

In the first round of voting, the response rate was 33/34 (97%). Based on the feedback provided by the panellists, the study team reworded 61 items. When voting on the final version of the 137 items (Table S1) in the second round, a response rate of 30/34 (88%) was achieved. This second round led to consensus on 125 items (122 agreed, 3 disagreed/rejected). Figure 3 presents the variability of responses to the different items voted on between the two voting rounds. Discussion of the remaining 12 items at the second meeting, attended by 17 panellists and the study co-ordinator (which was considered quorate), led to consensus on six items (five agreed, one disagreed/rejected); six items did not reach consensus and, of these, four were removed due to lack of published evidence (items 99, 100, 105, 106, see Figure 1). Full response rates are shown in Table S1. At the third meeting, which was attended by 17 panellists and the study moderator, it was agreed that a further three items should be removed due to lack of published evidence (128, 130, 131), and that items for which 10% or more of the panellists selected 'don't know or don't want to answer' should be highlighted as 'poor response rate'.

The following sections summarise key consensus statements (Table 3) and those items for which 10% or more of respondents voted 'don't know/don't want to answer ($n = 18$)' (Table 4).

Definitions/Terminology (items 1–18)

There was strong agreement to adopt definitions proposed by the International Myopia Institute (IMI) and the Meta-analysis of Pathologic Myopia (META-PM) study groups and to acknowledge the World Health Organization (WHO)

TABLE 1 Panellists' conflicts of interest.

Family name	First name	Conflicts of interest
Dahlmann-Noor	Annegret H	Advisory boards Thea, Santen, CooperVision, SightGlass Vision, Speaker/writer honoraria Santen, CooperVision, Novartis, Investigator CHAMP, CHAMP-UK, Ocumension, MyopiaX
Neema	Ghorbani-Mojarrad	Consultancy or research funding/in-kind contributions from: Hoya Vision, Alcon, Menicon, Coopervision, Eyerising International
Allen	Peter M	CHAMP-UK Investigator
Beach	Michelle L	Key Opinion Leader for Menicon & Alcon
Doyle	Lesley	Current research funding and/or consultancy activities: Hoya Vision, EssilorLuxottica, SightGlass, Cylite, Wolffsohn Research Ltd
Evans	Bruce JW	Research funding, consultancy and lecturing fees Hoya, lecturing fees EssilorLuxottica
Guggenheim	Jeremy A	No financial conflicts of interest. Editorial board member of IOVS, TVST and OPO (unpaid). Member of Fight for Sight UK grants panel (unpaid). Member of CHAMP-UK Data Safety Monitoring Committee (unpaid). Consultancy service for companies (unpaid; fee always paid directly by company to a charity chosen by the company)
Hammond	Christopher J	Consultancy for Nevakar/Vyluma
Logan	Nicola S	Consultancy for CooperVision, DopaVision, EssilorLuxottica, Menicon, SightGlass Vision. Research funding from CooperVision, EssilorLuxottica, Ocumension, SightGlass Vision
Loughman	James	Company Ownership – Ocumetra Limited; Financial Relationships – Dopavision, Ebiga Vision, Topcon; Research Funding – Coopervision, Vyluma, Dopavision, Topcon, EssilorLuxottica, Ocumension
Mallen	Edward AH	Consultancy for Essilor-Luxottica
McCullough	Sara J	Research/consultancy funding and/or collaboration with Hoya, Coopervision, Essilor, Sightglass, Oculus
Nagra	Manbir	Hoya International
Saunders	Kathryn J	Research funding from Hoya Vision and Vyluma, consultancy for CooperVision and Essilor
Strang	Niall	Investigator CHAMP, CHAMP-UK.
Wolffsohn	James S	Consultant: Alcon, Coopervision, Dopavision, SightGlass Vision, Thea; Chief Scientific Officer of International Myopia Institute; Funding: SightGlass Vision

definition of high myopia as alternative in specific contexts (1–15). Several of the proposed statements relating to META-PM definitions generated a high rate of 'don't know/don't want to answer' responses (Table 4, items 12–14, 18).

Importance of myopia and myopia management, screening programmes and accessibility of interventions (items 19–27, 65–68)

There was strong agreement with statements supporting public funding of myopia management interventions and that further epidemiological evidence would be useful to develop the case for such funding (23, 65–68). Strong agreement supported the statement that evidence was strong enough for ECPs to recommend interventions (24). The panellists strongly agreed that a screening programme is not needed, as myopia is readily detectable by existing systems (25).

Ocular history and referral to the hospital eye service (items 29–35, 69)

Statements advocating that information regarding family history of myopia and high myopia, history of retinopathy of prematurity (ROP) and other systemic conditions and syndromes should be elicited from parents of children attending for myopia management achieved strong to moderate consensus (29–32). Following discussion at the second panel meeting, there was similar agreement on statements identifying when a child with myopia might benefit from evaluation in the hospital eye service (33–35, 69). The panel agreed that CYP with myopia whose best-corrected acuity (BCVA) was significantly reduced for their age at more than one visit, and those younger than 10 years of age with both high myopia and features possibly indicating other underlying conditions should be referred (33–35).

Behavioural recommendations (items 36–48)

The panel strongly agreed with statements that spending time outdoors may delay the onset of myopia and have a small beneficial impact on myopia progression (36, 38). They also agreed that the exact duration of time outdoors is uncertain (37), but 2 h/day may have a protective effect (38). The panel did not reach consensus regarding whether holding books/screens at 30 cm or beyond from the face slows myopia progression (40)

TABLE 2 Panel characteristics.

Mean age (standard deviation) in years	**46.8 (9.56)**				
Age group, *n* (%)					
≤39 years	7 (23)				
40–49 years	9 (29)				
≥50 years	15 (48)				
Sex, *n* (%)					
Male	15 (49)				
Female	16 (51)				
Mean (standard deviation) years since primary qualification	24 (8.8)				
Panellists with no conflict of interest, *n* (%)	16 (58)				
Type of practice setting, *n* (%)					
Partner in independent optometry practice	3 (9)				
Employed by independent optometry practice	4 (12)				
Leading franchise optometry practice/ employed by franchise optometry practice	0 (0)				
Academic/research optometry clinic	20 (64)				
Hospital eye clinic	8 (26)				
Hospital eye research facility	3 (9)				
Biomedical/fundamental science academic lab	4 (12)				
No patient-facing role	2 (6)				
Experience					
	None	≤10	11–100	101–500	≥500
Number of children and young people managed with any myopia management intervention over the past 5 years *n* (%)	5 (16)	2 (6)	15 (48)	9 (29)	0 (0)
Number of myopia-related research projects involved in, either as principal or as co-investigator *n* (%)	None	≤10	11–20	21–50	≥50
	4 (13)	15 (48)	7 (22)	4 (13)	1 (3)
Number of publications on a myopia-related topic as author or co-author in the past 10 years *n* (%)	None	≤5	6–10	10–20	≥20
	4 (13)	9 (29)	7 (22)	4 (13)	7 (22)
Number of myopia-related grant applications led or co-applied for over the past 10 years	None	≤5	6–10	11–20	≥20
	8 (26)	12 (39)	4 (13)	5 (16)	2 (6)
Previously developed or contributed to the development of a myopia management protocol or algorithm *n* (%)	23 (74%)				

Note: Thirty-one of 34 panel members completed the panellist survey.

and a statement supporting the beneficial effect of 'good lighting' at the desk was rejected (39). There was strong agreement that myopia management awareness campaigns should include optometry and General Medical Practitioner practices (46, 47), and moderate agreement that schools should be included in such campaigns (48).

When and how to start an intervention (items 49–53, 58–64, 70–72, 84)

The panel achieved strong consensus that interventions should be discussed with all families of children at risk of or demonstrating myopia progression (60, 61), including those with onset of myopia before the age of 5 years (60).

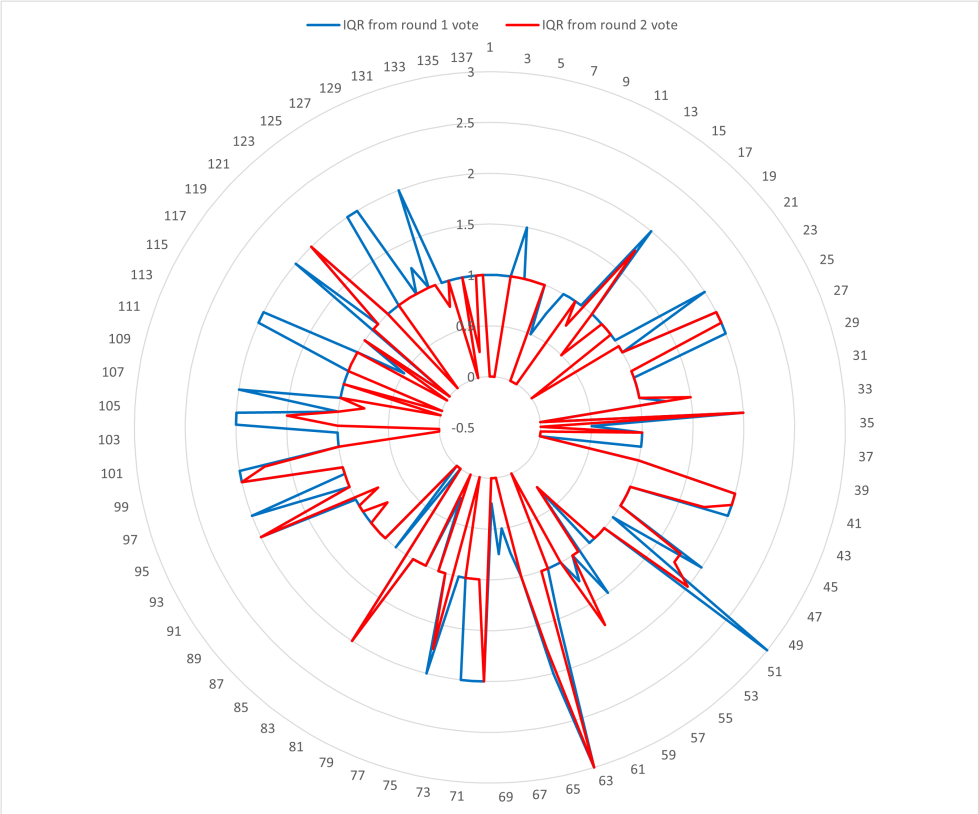

FIGURE 3 Radar chart showing the change in response of voting rounds 1 (blue) and 2 (red). Running number of statements on the outside of the chart; Interquartile range (IQR) of responses on the radial axis. Expert opinions converge as feedback is provided on previous response rates, as expected.

Statements advocating offering interventions to children with syndromic myopia and myopia associated with ROP prompted a high rate of 'don't know/don't want to answer' responses (58, 59).

There was strong agreement that a discussion about myopia management should be held as soon as possible for children who develop myopia before 13 years of age (62), without the prior need to monitor progression. After discussion at the second panel meeting, the panel strongly agreed with the statement that interventions can be implemented at a routine general ophthalmic services appointment (GOS, a contract under which the National Health Service remunerates primary care ECPs in the UK) (63). However, there was moderate agreement with the statement that recommended a separate appointment to discuss interventions (64).

During electronic voting, a statement that a parent/person with parental responsibility should give informed written consent to start an intervention found moderate agreement, but in response to concerns voiced during the final panel meeting, the wording was modified to include verbal consent (49).

After discussion, the panel agreed that CYP should have the opportunity to agree with the treatment plan (50) and strongly agreed that no intervention should be started against the child's wishes (51). From 16 years of age, the panel strongly agreed that CYP can give consent for themselves (62), and with Gillick competency or equivalent,[28,29] a person younger than 16 years of age who is able to understand risks and benefits can consent (63).

A statement that children with suspected pre-myopia younger than 13 years of age should have a cycloplegic refraction every 12 months, unless there are contraindications or biometry is available, achieved moderate agreement (70). The panel strongly agreed with statements indicating that before starting any intervention, non-cycloplegic AL, cycloplegic (auto)refraction/retinoscopy and near point and/or amplitude of accommodation should be measured, if available (71, 72, 84).

Optical interventions (items 54–57, 115–118)

The panel strongly agreed with statements stating that myopia management contact lenses and spectacle lenses are suitable as a first-line therapy (115), and that no single optical intervention has demonstrated superiority (117). They strongly agreed that ECPs should have discretion to discuss and use off-label prescription alternative Conformité Européenne (CE)/US Food and Drug Administration (FDA)/UK Conformity Assessed (UKCA)—marked products for myopia management, for example, multifocal contact lenses

TABLE 3 Summary of strength of consensus on agreement/disagreement, expressed as medians and proportions of votes.

	Strength of consensus (median)	Strength of consensus (IQR)
Definitions/Terminology		
1. We shall adopt the IMI definition of myopia: cycloplegic spherical equivalent equal to or more than −0.50 D.	5	0
2. In clinical practice, low myopia is defined as cycloplegic spherical equivalent of −0.50 D to less than −3.00 D.	4	0
3. In clinical practice, moderate myopia is defined as cycloplegic spherical equivalent of −3.00 to less than −6.00 D.	4	0
4. In clinical practice, high myopia is defined as cycloplegic spherical equivalent of greater than −6.00 D.	4	1
5. An alternative definition of high myopia (WHO) is cycloplegic spherical equivalent equal to or greater than −5.00 D.	4	1
6. For pre-myopia, we shall adopt the IMI definition: cycloplegic spherical equivalent less than or equal to +0.75 D and less than −0.50 D in a child younger than 13 years.	4	1
7. For axial myopia, we shall adopt the IMI definition: myopia primarily caused by an axial length greater than expected for age.	5	1
8. For refractive myopia, we shall adopt the IMI definition: myopia primarily caused by the configuration of cornea and lens.	5	1
9. For secondary myopia, we shall adopt the IMI definition; myopia caused by an underlying ocular or systemic condition or syndrome.	5	1
10. This consensus should include definitions relating to myopia-associated complications.	4	0
11. For pathological myopia, we shall adopt the WHO summary: high myopia plus any of these complications: myopic macular degeneration or glaucomatous optic neuropathy or retinal breaks/detachments.	4	0
12. We recommend using the META-PM classification of myopic retinopathy: Category 0: no myopic retinal degenerative lesion; Category 1: tessellated fundus; Category 2: diffuse chorioretinal atrophy; Category 3: patchy chorioretinal atrophy; Category 4: macular atrophy.[a]	4	0
13. We shall adopt the definition of 'plus lesions' as per META-PM: lacquer cracks; myopic choroidal neovascularisation; and Fuchs spot.[a]	4	0
14. Posterior staphyloma is another important sign of myopic retinopathy; as stated by the META-PM classification.[a]	4	1
15. Based on the META-PM classification, myopic maculopathy can be defined as 'myopia with chorioretinal atrophy equal to or worse than diffuse atrophy within the macular area'.[a]	4	0.75
16. We shall use the term 'myopia management' rather than 'myopia control'.	5	1.75
17. Myopia-related complications are very rare in children and young people under the age of 18 years (less than 1 in 10,000).	4	1
18. Myopia-related, sight-threatening complications in adulthood are rare to uncommon: retinal detachment 2 in 10,000 in England, myopic maculopathy UK/Ireland prevalence unknown. worldwide prevalence, 2%).[a]	4	0.5
Why are myopia and myopia management important? Should there be a screening programme?		
19. Myopia increases the relative risk of permanent sight loss from complications in adult life.	5	1
20. Myopia progression may worry young people and their parents/carers.	4	1
21. In the UK and Ireland families who have lived experience of high myopia and/or its associated complications may be concerned about myopia progression in their child.	5	1
22. With increasing myopia, young people become more dependent on wearing glasses or contact lenses.	5	0
23. To develop recommendations for management and public funding, more epidemiological data are needed about myopia prevalence and progression rates in the UK and Ireland.	4	1

(Continues)

TABLE 3 (Continued)

	Strength of consensus (median)	Strength of consensus (IQR)
24. Existing evidence from clinical trials is strong enough for eye care professionals to recommend MMI for children and young people in the UK and Ireland.	4	1
25. In the UK and Ireland, a screening programme for myopia is not needed, as myopia is readily detected by existing systems.	4	2
26. In the UK and Ireland, there should be a screening programme for myopia with cycloplegic autorefraction at age 6 years.	2	2
27. Children taking part in school vision screening in reception year (age 4–5) should undergo cycloplegic autorefraction.	2	1
Accessibility		
65. While myopia management interventions are not publicly funded, practitioners should be sensitive to families' financial situation; finances need to be discussed and considered, and the discussion documented.	5	1
66. Myopia management interventions should be publicly funded for children with evidence of progression of 1D (cycloplegic spherical equivalent) or more over the preceding 12 months.	4	0.25
67. Myopia management interventions should be publicly funded, at least partially, if there is evidence that they should slow down progression in a given child.	4	0
68. Interventions should be publicly funded if randomised controlled trials have been shown that they significantly reduce axial elongation, when the child is within the age and parameters that have demonstrated evidence of effectiveness.	4	0
Ophthalmic history		
When taking the history, questions for assessment of a child who attends for a myopia management should include:	5	1
28. Number of parents with myopia		
29. Number of parents with high myopia	5	1
31a. History of treatment for retinopathy of prematurity (risk factor for myopia)	5	1
31b. History of systemic conditions, including developmental conditions and syndromes	5	1
32. If early-onset myopia: problems with navigating in the dark (bedroom, cinema)[a]	4	1.5
When to refer to the hospital eye service		
69. The hospital eye service should play a role in myopia management for early onset myopia only (age 5 or lower), providing assessment for underlying conditions (such as Sticklers or retinal dystrophy), if any are suspected.	4	0
33. Children should be referred for further investigations (electrodiagnostic and/or genetic/molecular workup for possible associated conditions), if: best-corrected visual acuity in both eyes reduced by 0.2 logMAR or more than normal for age on two consecutive visits	4	0
34a. younger than 5 years with myopia greater than −2.00 D (cycloplegic spherical equivalent) in both eyes	3.5	2
34b. rephrased: if younger than 10 years with high myopia and suspicious features including reduced best-corrected visual acuity for age	*4*	*1*
35. Family history of myopia-associated syndromes such as Marfan, Ehler Danlos, Stickler, etc.	4	0
Behavioural recommendations		
36. Spending time outdoors may delay the onset of myopia.	5	1
37. The exact duration of time outdoors to delay myopia onset is uncertain, but 2 h a day may have a protective effect.	4	0
38. Spending 2 h a day outdoors may have a small beneficial effect on myopia progression.	4	0
39. Good lighting at the desk or table when doing homework (500 lux or more) may delay myopia onset and slightly slow progression.	*3*	*0*

TABLE 3 (Continued)

	Strength of consensus (median)	Strength of consensus (IQR)
39. Rephrase: Good lighting at the desk or table when doing homework delays myopia onset and slows progression.	1	0.75
40a. There is currently little evidence to suggest that holding books and screens at 30 cm or more from the face reduces progression.	*3*	*1*
40b. Rephrased: There is currently some evidence to suggest that holding books and screens at 30 cm or more from the face reduces progression.	3	3
41. We adopt the WHO recommendation that for children under the age of 2 years, time on screens is not recommended although the evidence for myopia prevention is limited.	4	2
42. We adopt the WHO recommendation that for children age 2–4 years, screen time should be less than 1 h per day although the evidence for myopia prevention is limited.	4	2
43. For children age 5–12 years, non-academic screen time should be limited to 2 h a day, if possible, though evidence of impact on myopia onset/progression is lacking.	4	1.75
44. The evidence for increasing time outdoors is sufficiently strong to be endorsed as public health message.	4	1
45. Campaigns to delay myopia onset and slow progression should include teachers to raise awareness of the importance of time outdoors and the need to wear glasses full-time.	4	1
46. Public health messages should be displayed in optometry practices.	4	1
47. Public health messages should be displayed in GP practices.	4	1
48. Public health messages should be displayed in schools.	4	1.75
When and how to start a myopia management intervention		
58. Myopia management can be offered to children with syndromic and progressive myopia, although evidence for effectiveness is lacking, but discussion with parent and child about off-label use and lack of evidence is required.[a]	4	1.75
59. Myopia management should be offered to children with axial myopia secondary to treatment for retinopathy of prematurity, although evidence for effectiveness is lacking, but discussion with parent and child about off-label use and lack of evidence is required.[a]	*3*	*1*
Not rephrased after discussion, voted on unchanged wording during meeting	3	1
60. Myopia management should be mentioned for children with onset of myopia before the age of 5 years, although this age group was not included in randomised controlled trials, the reason for not including younger children in trials being that they cannot co-operate with stringent outcome assessments. This limitation should be discussed with the parents.	4	0
61. Practitioners should mention MMI for those at risk of myopia progression or demonstrating progression.	5	1
62. It is recommended to discuss starting an MMI as soon as possible for children who become myopic before the age of 13 years, without the need to monitor for progression beforehand, such as at first appointment.	4	1
63. Optical treatments to slow myopia progression can be started at a routine GOS appointment, provided the practitioner feels they have had sufficient time to carry out all necessary assessments, and parent and child have enough time to consider the options and give informed consent.	*4*	*3*
Not rephrased after discussion, voted on unchanged wording during meeting	4	1
64. A separate appointment to discuss MMI and assess suitability of different options is recommended before starting treatment.	4	1.75
49. A parent or person with parental responsibility should give informed written consent to start a MMI.[b]	4	1.75
50a. The child/young person should also give verbal or written assent to start an MMI.	*3*	*3*
50b. Rephrased: The CYP should have the opportunity to agree with the treatment	4	1.5
51. No intervention can be started against the child's wishes.	4	1

(Continues)

TABLE 3 (Continued)

	Strength of consensus (median)	Strength of consensus (IQR)
52. From the age of 16 years, the young person can give consent for themselves.	5	1
53. Gillick competence applies even before the age of 16 years—if a young person is able understand risks/benefits of a MMI, they can consent to using it.	4	1
70. Children with suspected pre-myopia younger than 13 years should have a cycloplegic refraction every 12 months, unless there are contraindications or biometry is available.	4	2
71. Before starting any MMI, the eye care practitioner should measure non-cycloplegic axial length, if available.	4.5	1
72. Before starting any MMI, the eye care practitioner should measure cycloplegic autorefraction, or cycloplegic refraction/retinoscopy.	4	1
84. Before starting an MMI, the ECP should measure near point or amplitude of accommodation.	4	0
Optical interventions		
115. At present, the following MMIs are appropriate as first-line intervention for most children and young people: peripheral-plus and diffusion-optics spectacles, dual-focus contact lenses and ortho-K.	4	1
117. There is no evidence that one optical MMI intervention is significantly superior to others.	4	1
116. It is at the eye care professional's discretion to discuss the use of alternative products with the family which may slow myopia progression, but do not have a CE/UKCA mark for myopia management, for example multifocal contact lenses.	4	0
118. Choosing the type of intervention should be a joint decision between the child/young person, the parent/carer and the eye care practitioner and take into account the young person's age, hobbies, lifestyle and their preference for contact lenses or glasses.	5	0
54. Peripheral-plus/diffusion-optics glasses, dual-focus and orthoK-contact lenses can be used in the presence of exotropia/esotropia (manifest strabismus), on a case-by-case basis with monitoring of binocular status.[a]	4	0.5
55. Peripheral-plus/diffusion-optics glasses, dual-focus and orthoK-contact lenses can be used in the presence of exophoria/esophoria (latent strabismus), with appropriate monitoring of binocular status.	4	0.25
56. Optical corrections that do not correct significant astigmatism (0.75 DC or more), such as some contact lenses, are permissible for patients with astigmatism, as long as the corrected VA is acceptable.	4	1
57. Correction of astigmatism when using MMI is at the discretion of the eye care practitioner.	4	1
Pharmacological interventions		
92. Atropine does currently not have a marketing authorisation for myopia management in the UK and Ireland; prescriptions can therefore only be issued at some institutions and within local governance frameworks.[a]	4	1
93. The role and provision of atropine in MM need to be reviewed once marketing authorisations and NHS funding decisions are in place.	4	0.75
119. Once marketing authorisation is in place, low-concentration atropine (0.05% or less) should be considered as first- or second-line intervention for myopia control, in addition to optical correction.	4	1
120. If the child or the family do not want to consider wearing correction during the day, orthoK, possibly combined with atropine (once marketing authorisation given) may be an option.	4	1
121. Children who, based on eye growth charts, have a 95% risk of developing axial length greater than 26 mm (axial length associated with high myopia and high risk of complications) should be monitored to detect progression, and be offered early combination treatment (optical plus pharmacological) if progression does occur.	4	2

TABLE 3 (Continued)

	Strength of consensus (median)	Strength of consensus (IQR)
122. Once atropine has received a marketing authorisation, risks and benefits of different concentrations should be discussed with the family, and a joint decision should be made about the starting concentration.	4	1
123. While there are no data from European trials yet, trial data from East Asia suggest that 0.05% low-concentration atropine may have a stronger beneficial effect and no increased risk of adverse effects (blurring of small font at near, light sensitivity requiring photochromic lenses).[a]	4	0
124. There is some evidence that combination of an optical and a pharmacological intervention has a stronger effect than each of these interventions separately.	*3*	*1*
124. Not rephrased after discussion, voted on unchanged wording during meeting	4	0
125. Combination treatment with an optical and a pharmacological intervention should be discussed, if there is evidence of cycloplegic spherical equivalent progression by more than 1D over the past 12 months, and a timeline for moving from single to combination treatment should be agreed with the family.[a]	4	1
126. Combination treatment with an optical and a pharmacological intervention should be discussed, if there is evidence of axial elongation by more than 0.4 mm over the past 12 months, and a timeline for moving from single to combination treatment should be agreed with the family.[a]	4	1
135. If a child develops itchy eyes after starting atropine eye drops and slit lamp assessment shows allergic conjunctivitis with punctate corneal staining, topical anti-histamines or combined antihistamines/mast cell stabilisers should be added for 4 weeks, and the situation reviewed to determine whether atropine should be discontinued.[a]	4	0.25
Monitoring and ongoing management		
73. Once a MMI is started, the child should initially be reviewed at least every 6 months, in line with IMI guidance, in order to avoid under-correction in case of fast progression.	4	1
74. From the age of 13 years, OR if progression appears to slow down in an MMI, follow-up at 12 monthly intervals may be sufficient.	4	0
75. At every follow-up visit for any child in myopia management, the eye care practitioner should measure non-cycloplegic axial length, regardless of the MMI used.	4	1.75
101. Axial length measurements are a more reliable indicator of progression than refraction.	4	1
102. Axial length measurements should be carried out every 6 months, WITHOUT cycloplegia.	4	0
103. Axial length measurements should be carried out every 6 months, WITH cycloplegia.	2	0
97. In clinical practice, myopia progression should be documented as mm/year increase in axial length or D/year increase in spherical equivalent.	5	1
104. As progression naturally slows down with age, treatment effect CANNOT be judged reliably by comparing progression before and after start of treatment, as it may have slowed because of age, not treatment.	4	1
91. The practitioner must consider their limitation in monitoring progression; if they cannot measure axial length, and they must discuss this limitation with the family.	4	1
76. Cycloplegic autorefraction or refraction/retinoscopy should be repeated at follow-up, if a significant change in prescription is suspected, if biometry data are not available.	4	1
77. The prescription for glasses/contact lenses can use a cycloplegic autorefraction as starting point, but needs to be checked/refined by manual refraction.	4	1
78. In young children, the prescription for glasses/contact lenses can be checked by manual cycloplegic refraction.	4	0
79. In older children and teenagers, the prescription for glasses/contact lenses could be refined by non-cycloplegic manual refraction.	4	1

(Continues)

TABLE 3 (Continued)

	Strength of consensus (median)	Strength of consensus (IQR)
80. Slit lamp assessment can be carried out at the eye care professional's discretion; if contact lenses or atropine eye drops are used, then a slit lamp assessment should be carried out at every follow-up visit.	5	1
81. Dilated fundoscopy or undilated wide-angle retinal imaging should be carried out at intervals at the eye care professional's discretion, depending on known/suspected eye conditions.	4	1
82. Fundoscopy including the peripheral retina or wide-angle retinal imaging should be carried out at least every 12 months.	*3*	*2*
82. Rephrased: Fundoscopy should be carried out periodically and per clinical judgement.	4	1
83. If myopia management contact lenses are prescribed, follow-up should include best practice for contact lens management, as per guidance from professional institutions, such as the College of Optometrists contact lens fitting and care guidelines.	5	0
85. During MMI monitoring, accommodation measurements can be repeated at the ECP's discretion.	4	0
86. A myopia management appointment may take more time than a standard appointment.	4	1
98. We should advise families not to use MMIs that are not CE/FDA/UKCA marked; off-label prescription of CE/FDA/UKCA-marked products is at the discretion of the eye care practitioner.	5	1
99. If families obtain MMI from elsewhere, the UK/Ireland eye care practitioner has a duty of care to provide follow-up assessments, or refer the child/young person to another practitioner, to reduce the risk of potential harm.	3	2
During meeting 2, decision to eliminate item, as professional standards prescribe that follow-up has to be offered, if patient eligible to be seen under General Ophthalmic Services. If MM desired and not available at that practice, College of Optometrists guideline states that referral to another eye care practitioner who can provide MM should be initiated.		
100. If families obtain MMI from elsewhere/from abroad, the UK/Ireland eye care practitioner does not have to provide follow-up assessments.	3.5	1.75
During meeting 2, decision to eliminate items, as professional standards prescribe that follow-up has to be offered, if patient eligible to be seen under General Ophthalmic Services. If MM desired and not available at that practice, College of Optometrists guideline states that referral to another eye care practitioner who can provide MM should be initiated.		
127. If visual acuity after starting any MMI is worse than 0.3 logMAR or more than one to two lines worse than best-corrected visual acuity, the practitioner should check adherence and any other contributing factors and consider discontinuing that option.	4	1
94. A central database of all children receiving MMI should be established for the UK (England, Wales, Scotland, Northern Ireland) and Ireland.	4	2
95. The MHRA yellow card system should be used to flag up any adverse events from optical, pharmacological and device-based interventions (https://yellowcard.mhra.gov.uk).	4.5	1
96. A central database should be developed to flag up any adverse events from optical and pharmacological interventions.	4	1
What are the criteria for treatment success?		
In clinical trials, cycloplegic spherical equivalent progression by −0.25 D was equivalent to axial elongation by around 0.10–0.15 mm.[a] 105. If growth percentiles are not available, then in a child younger than 13 years, 0.15 mm or less progression of axial length in both eyes over 12 months can be considered as an indicator of full short-term success.	4	1.5
106. If growth percentiles are not available, then in a young person age 13 years or older, where progression naturally slows down, 0.08 mm or less increase of axial length in both eyes over 12 months can be considered as an indicator of full short-term success.[a]	4	1
107. Progression while using an MMI should not be judged based on refraction only, even if cycloplegic.	4	0.75

TABLE 3 (Continued)

	Strength of consensus (median)	Strength of consensus (IQR)
108. Practitioners should explain to families why axial length change is important as indicator of progression.	4	1
One definition of 'clinically meaningful progression' is cycloplegic spherical equivalent progression by more than −0.25 D/year.		
109. Progression by −0.25 D or less over 12 months is an indicator of full short-term success.	4	0
110. Progression by −0.75 D or less cycloplegic spherical equivalent over 36 months is an indicator of full medium-term success.	4	1
111. If an eye growth chart is used, then a change to a lower percentile (flattening of the individual growth curve) is one indicator of success.	4	0
112. If full success is not achieved with a single intervention over a 6-month period, adherence should be discussed before considering a change in treatment.	4	1
113. If full success is not achieved over 12 months despite good adherence, a pharmacological intervention should be considered once these receive a marketing authorisation for the UK and Ireland.	4	1
114. If full success is not achieved over 12 months despite good adherence, a different optical intervention should be considered, although the evidence for differences in mechanism of action is currently uncertain.[a]	4	1
Practitioner training/CPD		
87. ECPs should be offered training based on available evidence and independent from manufacturers/companies.	5	1
88. All eye care professionals who prescribe optical devices/correction should undertake training in myopia management.	4	1
89. Eye care professionals who wish to prescribe MMI should undertake training in myopia management beyond that offered by companies.	4	1
90. Eye care professionals undertaking MMI should collate a yearly audit of progression rates.	4	0.75
Stopping myopia management interventions		
128. Treatment reduction or discontinuation should be considered when there has been 0.25 D or less progression of the spherical equivalent refraction in both eyes at 2 consecutive visits 12 months apart, in young people age 13 years and older.	3	1
128. Meeting 2 concluded that current evidence is insufficient to support or oppose this statement.		
129. Treatment reduction or discontinuation should be considered when there has been 0.25 D or less progression of the spherical equivalent refraction in both eyes at 2 consecutive visits 12 months apart, and the young person has completed formal education.	4	1
130. Treatment reduction or discontinuation should be considered when there has been 0.12 mm or less axial length progression in both eyes at 2 consecutive visits 12 months apart, in young people age 13 years and older.	3	1
130. Meeting 2 concluded that current evidence is insufficient to support or oppose this statement.		
131. Treatment reduction or discontinuation should be considered when there has been 0.12 mm or less axial length progression in both eyes at 2 consecutive visits 12 months apart, and the young person has completed formal education.	4	0.75
132. Myopia management may need to be continued into early adulthood, given the risk of myopia progression in certain groups (e.g., university students); ongoing monitoring is recommended until myopia stabilises.	4	1
133. Restarting treatment should be considered if after discontinuation there is further progression, taking into account age, lifestyle and any other relevant factors.	4	0
134. Treatment with atropine should be reduced gradually by reducing the concentration every 6 months while monitoring progression, acknowledging that formal evaluation of 'weaning' regimes is currently lacking.[a]	4	1

(Continues)

TABLE 3 (Continued)

	Strength of consensus (median)	Strength of consensus (IQR)
136. MMIs should be trialled for at least 12 months, if there are no adverse events, before deciding about a lack of effectiveness.	4	1
Mechanisms of interventions		
137. At present, the evidence as to how interventions change the structure and development of the eye is incomplete and outside the focus of this consensus.	4.5	1

Note: Strength of consensus was calculated as median and interquartile range (IQR) of numerical response categories. Strong consensus on agreement was defined as a median of 4 or 5 with IQR of 1 or less (dark green); moderate consensus on agreement as median as median of 4 or 5 with IQR greater than 1 and lower or equal to 2 (light green). Strong consensus on disagreement was defined as median of 1 or 2 with IQR of 1 or less (purple) and moderate consensus on disagreement as median of 1 or 2 with IQR greater than 1 and lower or equal to 2 (pink). A median of 3 with any IQR, or a median of 1, 2, 4 or 5 with IQR >2 was categorised as 'no consensus reached' (white). In italics, items that did not reach consensus in two rounds of voting and were discussed at the second panel meeting. Consensus on agreement was reached in two rounds of voting for $n = 122$ items, consensus on disagreement for $n = 3$ and consensus was not reached for $n = 6$. Of these, four were removed due to availability of professional guidance (items 99, 100) or lack of published evidence (items 105, 106). Three items were removed after discussion at the third panel meeting (128, 130, 131), despite previous consensus, as the panel felt that published evidence is currently lacking. In total, consensus on agreement was reached for $n = 119$ and on disagreement for $n = 3$ items. CPD: Continuing professional development; CYP: Child/young person; GOS: General ophthalmic services; META-PM: Meta-analysis of pathologic myopia classification; MHRA: Medicines and Healthcare products Regulatory Agency in the UK; MMI: Myopia management intervention; ortho-K: orthokeratology; WHO: World Health Organization; CE mark: Conformité Européenne, indicates that products sold in the European Economic Area have been assessed to meet high safety, health and environmental protection requirements; UKCA mark: UK Conformity Assessed—for goods placed on the market in Great Britain from 1 January 2023, currently used alongside CE-marking; FDA: US Food and Drug Administration; manual refraction: Retinoscopy (as opposed to autorefraction).

[a]Items for which 10% or more of panellists selected the response 'don't know/don't want to answer'; these are summarised in Table 4.

[b]Item 49 was amended in the final panel meeting to omit the word 'written'; the panel felt that verbal consent would be appropriate.

(116), acknowledging that the requirements vary between regulatory authorities. The panel strongly agreed with statements advocating that decisions regarding which treatment is most suitable should include CYP, parent and practitioner (118), and that the child's lifestyle and preferences should be taken into account. The panel strongly agreed with the statements that optical interventions can be used in the presence of heterophoria, with appropriate monitoring of binocular function (55). Where astigmatic errors cannot be fully corrected by myopia interventions, but VA is acceptable, the use of these interventions is at the discretion of the ECP (56). There was a high rate of 'don't know/don't want to answer' responses when considering a statement advocating that optical interventions can be used in the presence of a manifest strabismus (54).

Pharmacological interventions (items 92, 93, 119–126, 135)

Of 11 items relating to low-concentration atropine, five prompted a high 'don't know/don't want to answer' response rate (Table 4, items 92, 123, 125, 126, 135). Five of the remaining six items in this domain elicited strong consensus from the panel who strongly agreed that when marketing authorisation is in place, low concentration atropine should be considered as a first- or second-line intervention for myopia management (119), including in combination with orthokeratology lenses (120). The panel strongly agreed that the risks and benefits of low-concentration atropine should be discussed with families to achieve a joint decision about its use and, after discussion at a panel meeting, that some evidence supports a stronger effect from combining low concentration atropine and optical strategies (123). Statements aiming to specify refractive and biometric growth characteristics which should prompt discussion of combined pharmacological and optical myopia management strategies elicited a high rate of 'don't know/don't want to answer' responses (Table 4, items 125, 126). Moderate agreement supported that children who, based on eye growth charts, have a 95% risk of developing axial length greater than 26 mm should be offered additional treatment early, if progression does occur.

Monitoring and ongoing management (items 73–86, 91, 94–104, 127)

Strong agreement was observed for the majority of statements in this domain (see Table 3). In particular, consensus supported 6-monthly non-cycloplegic AL measurements during myopia management (73, 102) and the importance of acknowledging the challenge of monitoring progression of myopia and success of treatment when appropriate devices are not available (91). Cycloplegic autorefraction and/or retinoscopy should be performed where AL measurements are not available (76); subjective refinement is required to obtain a prescription for optical correction (79). The panel strongly agreed that ECPs should adhere to professional guidance and use professional judgement (80–83).

The panel strongly agreed that if visual acuity while wearing a myopia intervention is worse than 0.30 logMAR or more than one to two lines worse than BCVA, the practitioner should check adherence and any other contributing factors and consider discontinuing that option (127). They also strongly agreed that the existing Medicines and Healthcare products Regulatory Agency (MHRA) in the UK yellow-card system (https://yellowcard.mhra.gov.uk) should be used to report adverse events of optical/

TABLE 4 For 18 items, 10% or more of panellists selected the response 'don't know/don't want to answer'.

Item	'Don't know/don't want to answer' replies (%)	% of items with 'don't know/don't want to answer' responses in this section
Definitions/Terminology		28 (5 of 18)
12. We recommend using the META-PM classification of myopic retinopathy: Category 0: no myopic retinal degenerative lesion; Category 1: tessellated fundus; Category 2: diffuse chorioretinal atrophy; Category 3: patchy chorioretinal atrophy; Category 4: macular atrophy.	27	
13. We shall adopt the definition of 'plus lesions' as per META-PM: lacquer cracks; myopic choroidal neovascularisation; and Fuchs spot.	27	
14. Posterior staphyloma is another important sign of myopic retinopathy, as stated by the META-PM classification.	13	
15. Based on the META-PM classification, myopic maculopathy can be defined as 'myopia with chorioretinal atrophy equal to or worse than diffuse atrophy within the macular area'.	27	
18. Myopia-related, sight-threatening complications in adulthood are rare to uncommon: retinal detachment 2 in 10,000 in England, myopic maculopathy UK/Ireland prevalence unknown. worldwide prevalence, 2%).	10	
Ophthalmic history		25 (1 of 4)
When taking the history, questions for assessment of a child who attends for a myopia management should include: 32. if early-onset myopia: problems with navigating in the dark (bedroom, cinema)	10	
When and how to start a myopia management intervention		13 (2 of 16)
58. Myopia management can be offered to children with syndromic and progressive myopia, although evidence for effectiveness is lacking, but discussion with parent and child about off-label use and lack of evidence is required.	13	
59. Myopia management should be offered to children with axial myopia secondary to treatment for retinopathy of prematurity, although evidence for effectiveness is lacking, but discussion with parent and child about off-label use and lack of evidence is required.	23	
Optical interventions		13 (1 of 8)
54. Peripheral-plus/diffusion-optics glasses, dual-focus and ortho - K contact lenses can be used in the presence of exotropia/esotropia (manifest strabismus), on a case-by-case basis with monitoring of binocular status.	10	
Pharmacological interventions		45 (5 of 11)
92. Atropine does currently not have a marketing authorisation for myopia management in the UK and Ireland; prescriptions can therefore only be issued at some institutions and within local governance frameworks.	17	
123. While there are no data from European trials yet, trial data from East Asia suggest that 0.05% low-concentration atropine may have a stronger beneficial effect and no increased risk of adverse effects (blurring of small font at near, light sensitivity requiring photochromic lenses).	13	

(Continues)

TABLE 4 (Continued)

Item	'Don't know/don't want to answer' replies (%)	% of items with 'don't know/don't want to answer' responses in this section
125. Combination treatment with an optical and a pharmacological intervention should be discussed, if there is evidence of cycloplegic spherical equivalent progression by more than 1D over the past 12 months, and a timeline for moving from single to combination treatment should be agreed with the family.	17	
126. Combination treatment with an optical and a pharmacological intervention should be discussed, if there is evidence of axial elongation by more than 0.4 mm over the past 12 months, and a timeline for moving from single to combination treatment should be agreed with the family.	17	
135. If a child develops itchy eyes after starting atropine eye drops and slit lamp assessment shows allergic conjunctivitis with punctate corneal staining, topical anti-histamines or combined antihistamines/mast cell stabilisers should be added for a period of 4 weeks, and the situation reviewed to determine whether atropine should be discontinued.	33	
What are the criteria for treatment success?		33 (3 of 9)
In clinical trials, cycloplegic spherical equivalent progression by −0.25 D was equivalent to axial elongation by around 0.10–0.15 mm.	10	
105. If growth percentiles are not available, then in a child younger than 13 years, 0.15 mm or less progression of axial length in both eyes over 12 months can be considered as an indicator of full short-term success.		
106. If growth percentiles are not available, then in a young person age 13 years or older, where progression naturally slows down, 0.08 mm or less increase of axial length in both eyes over 12 months can be considered as an indicator of full short-term success.	10	
114. If full success is not achieved over 12 months despite good adherence, a different optical intervention should be considered, although the evidence for differences in mechanism of action is currently uncertain.	10	
Stopping myopia management interventions		13 (1 of 8)
134. Treatment with atropine should be reduced gradually by reducing the concentration every 6 months while monitoring progression, acknowledging that formal evaluation of 'weaning' regimes is currently lacking.	23	

Note: These were typically items for which high-quality evidence is currently lacking or emerging. META-PM, Meta-analysis of pathologic myopia classification; Ortho-K, orthokeratology.

pharmacological interventions (95). There was moderate agreement with the statement that a UK/Ireland database of CYP receiving interventions should be developed (94).

Criteria for treatment success (items 105–114)

Of 10 items relating to monitoring, three had a high rate of 'don't know/don't want to answer' responses (Table 4, items 105, 106, 114). However, the panel strongly agreed with the importance of AL measurements to monitor progression during myopia management, and that progression cannot be judged based on refraction only, even if cycloplegic (75, 101, 107, 108). The panel also agreed that treatment effect cannot be judged reliably by comparing progression before and after the start of treatment, as it may have slowed because of age, rather than the effect of treatment (104). The panel also strongly agreed that a change to a lower percentile on an eye growth chart/nomogram may indicate success in slowing progression (111). In the context that one definition of 'clinically meaningful progression' is cycloplegic spherical equivalent progression by more than −0.25 D/year'; the panel strongly agreed that progression of 0.25 D or less over 12 months may be an indicator of short-term success of an intervention (109) and progression of 0.75 D or less over 36 months, may indicate medium-term success (110).

The panel strongly agreed that if progression reduction is not achieved at 6 months, adherence should be

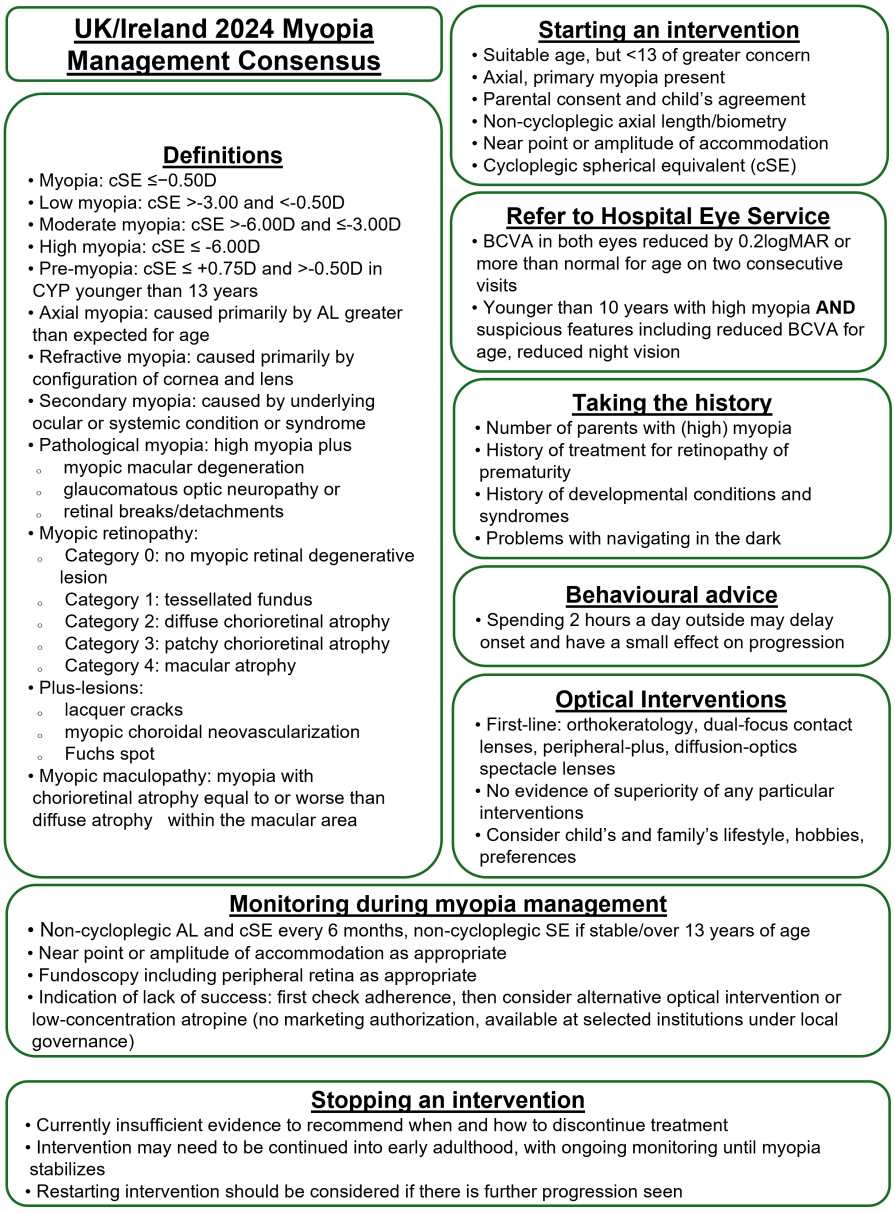

FIGURE 4 Summary of definitions and recommendations of the 2024 UK/Ireland Myopia modified Delphi Consensus. AL, axial length; BCVA, best-corrected visual acuity; cSE, cycloplegic spherical equivalent; CYP, children and young people; MM, myopia management; MMI, myopia management intervention; SE, spherical equivalent.

discussed before considering a change in treatment (112), and that if successful myopia control is not achieved at 12 months despite good adherence, a pharmacological approach should be considered when market authorisation for low-concentration atropine is in place (113).

Practitioner training (items 87–90)

The panel strongly agreed that ECPs should be offered evidence-based training independent from intervention manufacturers (87), and that ECPs responsible for prescribing interventions should undertake appropriate training (89). The statement 'ECPs should collate a yearly audit of progression rates in children under their care' also found strong agreement (90).

Stopping interventions (items 128–136)

Of eight items in this section, two (items 128 and 130) were removed, as discussion at the second panel meeting concluded there was insufficient evidence to support specific AL, refractive error, lifestyle and age-related criteria to decide when to discontinue. A further item (131) was removed for the same reason at the third meeting. Conversely, the panel strongly agreed with statements proposing that interventions may need to be continued into early

adulthood, with ongoing monitoring until myopia stabilises (132), and that restarting interventions should be considered if there is further progression (133). The panel also strongly agreed that more evidence for 'tapering' regimes for low-concentration atropine is needed (134).

DISCUSSION

Key findings

This work describes the largest UK and Ireland myopia management consensus to date, established with transparent methodology and involving ECPs and academics from a variety of backgrounds and settings. Key agreements are summarised in Figure 4.

Limitations

The panel recruitment process may not have reached all eligible practitioners. Future myopia management consensus exercises would ideally include dispensing opticians. Some statements may have been interpreted differently by different panellists, although the initial item generation and question wording refinement included all panellists, with survey response rates of 97% and 94%. However, future consensus exercises should provide greater clarity of statements, particularly regarding when and how to start interventions, and should include specific details such as cycloplegic agents and regimes. The second meeting was attended by half of the panellists, which was considered quorate; there is no formal recommendation for quorum threshold in Delphi panel attendance.

Interpretation

Future myopia management research should target current areas of uncertainty, identified here as items with a high percentage of 'don't know/don't want to answer' responses (Table 4). Of these 18 items, two were removed during the second panel meeting (105 and 106) due to a lack of published evidence. In the third panel meeting, three further items which referred to progression rates (128, 130, 131) were removed, as published evidence for 'target' progression rates for monitoring and decisions about treatment is lacking at present and should be explored in future research. Plotting individual AL measurements onto epidemiological eye growth nomograms[30,31] may be current best practice to monitor progression but may also have limitations.[32] Nomograms of AL progression by age, in emmetropic and myopic children, with and without treatment, have recently become available.[33–35] Consensus is needed on whether 'emmetropic growth rate' or halting myopic eye elongation should be the treatment target.[34,35]

The remaining two removed items (99, 100) were eliminated during meeting 2, as professional standards require that follow-up has to be offered, if a patient is eligible to be seen under the GOS contract, and that if myopia management is desired and not available at that practice; the College of Optometrists guideline states that referral to another ECP who can provide myopia management should be initiated.

Two items failed to reach consensus (40 and 59), and these also highlight areas where future research would be valuable: the role of interventions in myopia after ROP treatment, and the role of duration of and working distance during near-work in potentially driving myopia onset and progression.

Existing definitions provide a universal terminology that practitioners in the UK and Ireland should adhere to.[36–38] Features associated with syndromic conditions underlying high myopia should prompt referral for investigations.[39] Better data are needed regarding the risk of myopia-related complications in adulthood. As UK-nations already carry out national audits on the treatment of retinal detachments and the use of intravitreal medications for age-related macular degeneration,[15,16,40] valuable data on myopia-related complications could be acquired with the addition of refractive and biometric (focimetry/AL) data.[41] Systematic capture of these data in glaucoma clinics might shed light on the prevalence of myopia-associated optic neuropathy. National data could inform health economic evaluations, exploring the impact of interventions on reducing prevalence of complications in later life which carry a significant burden for the individual, their family, healthcare providers and society.[42]

As myopia progression is fastest before the age of 13 years, interventions should be discussed with all children with myopia in this age group and their families.[30,43,44] Previous progression rates in isolation may not be suited to guide decisions about starting treatment, as suggested by prior studies,[45,46] although it is important to note that they were not conducted with modern optical biometry. Evidence of effectiveness and benefit of myopia management interventions exists for children with isolated myopia, but is lacking for very young children, those with myopia secondary to underlying syndromes and those treated for ROP. Children under 6 years of age and with other syndromes or conditions have generally been excluded from randomised controlled trials, so it is currently unclear whether interventions are appropriate or effective for these groups.

The choice of the initial intervention should be guided by the child's and family's preferences/lifestyle, and evidence is needed for equivalence/superiority of particular optical/pharmacological interventions and combination regimes.[7,47,48] Predictive algorithms for the relative effectiveness of interventions for an individual patient are yet to emerge, but would be helpful in supporting intervention selection. Additionally, clear evidence regarding individual benefit from interventions is needed.[44]

To develop guidance on long-term myopia management, phase 4/post-marketing surveillance studies are essential, and findings need to be considered in the context of genetic background and environment. While myopia progression often stabilises by the age of 16 years,[31,49,50] those who continue formal education and those with high myopia may experience ongoing progression and require monitoring until myopia has stabilised.[11]

Generalisability/Adequacy of conclusions

The broad range of expertise and geographic spread provided by the panel members ensures that our recommendations are applicable to at least those in the UK and Ireland who currently provide myopia management. They may guide the development of myopia clinics and help policy makers decide how to allocate resources to provide an efficient service with equitable access.

AUTHOR CONTRIBUTIONS

Annegret H. Dahlmann-Noor: Conceptualization (lead); data curation (equal); formal analysis (equal); investigation (equal); methodology (equal); software (equal); visualization (equal); writing – original draft (equal); writing – review and editing (equal). **Neema Ghorbani-Mojarrad:** Conceptualization (lead); data curation (equal); formal analysis (equal); investigation (equal); project administration (equal); writing – original draft (equal); writing – review and editing (equal). **Katie M. Williams:** Data curation (equal); formal analysis (equal); investigation (equal); project administration (equal); writing – original draft (equal); writing – review and editing (equal). **Ahmed Ghoneim:** Conceptualization (equal); formal analysis (equal); investigation (equal); project administration (equal); writing – original draft (equal); writing – review and editing (equal). **Peter M. Allen:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Michelle L. Beach:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Gillian Bruce:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Hetal D. Buckhurst:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Phillip J. Buckhurst:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Fiona E. Cruickshank:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Matthew P. Cufflin:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Mhairi D. Day:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Lesley Doyle:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Bruce J. W. Evans:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Daniel Ian Flitcroft:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Lyle S. Gray:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Indie Grewal:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Jeremy A. Guggenheim:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Christopher J. Hammond:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Jason C. Higginbotham:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Imran Jawaid:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Stephanie Kearney:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **John G. Lawrenson:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Nicola S. Logan:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **James Loughman:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Edward A. H. Mallen:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Sara J. McCullough:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Manbir Nagra:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Kathryn J. Saunders:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Dirk Seidel:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Tanvi Shah:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Niall C. Strang:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Kathryn J. Webber:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **James S. Wolffsohn:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal). **Alexandra L. Young:** Investigation (equal); writing – original draft (equal); writing – review and editing (equal).

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Disclosure is detailed in Table 1.

DATA AVAILABILITY STATEMENT
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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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