BCLA CLEAR

GLOBAL Contact Lens Evidence-based Academic Report

Introduction

The BCLA Contact Lens Evidence-based Academic Report (CLEAR) totals more than 300 pages across 11 papers. Coordinated by 10 committee chairs, written by 102 authors based in 16 countries, it was published in March 2021 and is available here.

BCLA CLEAR sets the standard to which eye care professionals (ECPs) can refer for the latest information in the contact lens field whilst also highlighting opportunities for future research. This summary draws on key points from the reports to help inform evidence-based practice.

Evidence-based practice

Evidence-based practice is defined as the *"conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients."* It integrates best available and clinically relevant scientific research evidence with a clinician's expertise and an individual patient's values and environment.

Key point:

It is a reasonable expectation of patients that ECPs base their decisions on the best available scientific evidence to help maximise the likelihood of success for contact lens wearers, maintain satisfaction with lens wear, retain wearers and grow their contact lens business.

Translating BCLA CLEAR into practice

This summary covers the key points of the patient journey from contact lens fitting to aftercare. The information confirms the validity of many common practices, highlights where evidence contradicts commonly-held beliefs, and identifies where gaps in knowledge still exist. Links are used to direct the reader to the full reports to access more information. When viewing online, click on the hyperlinks to access the relevant full report.

Related resources

Evidence-based further education certification by the BCLA

- Dry Eye Management and Contact Lens Retention
- Myopia Management

Terminology and standard abbreviations

BCLA CLEAR clarified the appropriate anatomical terminology practitioners should adopt to ensure we are all speaking the same language (Table 1). Likewise, abbreviations can be confusing, and a standardised set have been proposed.

Table 1: New terminology to be aware of

Original	**New terminology**	Rationale
Bowman's membrane	**Anterior limiting lamina**	Recommending use of standardised, descriptive nomenclature within contact lens practice - using terminology recommended by the Federative Committee on Anatomical Terminology (FCAT)[1,2] , see Figure 1 and BCLA CLEAR Anatomy and Physiology Report
Descemet's membrane	**Posterior limiting lamina**	
Rigid gas permeable (RGP or GP) lens	**Rigid corneal lens (RCL)**	All modern lenses are gas permeable; 'scleral lens' has been recommended for all lenses fitted to completely vault over the cornea and land on the conjunctiva,[3,4] so 'corneal' is used here to describe a smaller, corneal-bearing lens[5]
Extended (6 nights) and continuous (30 nights) wear	**Planned or sporadic overnight wear**	'Extended' and 'continuous' wear have been used interchangeably, the current definitions overlap and neither term accounts for occasional overnight wear or napping in contact lenses. New terminology covers all of the above and provides a distinction between planned or unplanned overnight wear
No previous agreed term	**Medical contact lenses**	Defined as any type of contact lens that is worn for the primary purpose of treating an underlying disease state or complicated refractive status; they may or may not correct refractive error and are prescribed for reasons other than the cosmetic purpose of eliminating the need for spectacles[6] See BCLA CLEAR Medical Uses of Contact Lenses Report for full definitions of: - **Therapeutic or bandage** contact lenses and **rehabilitative** contact lenses

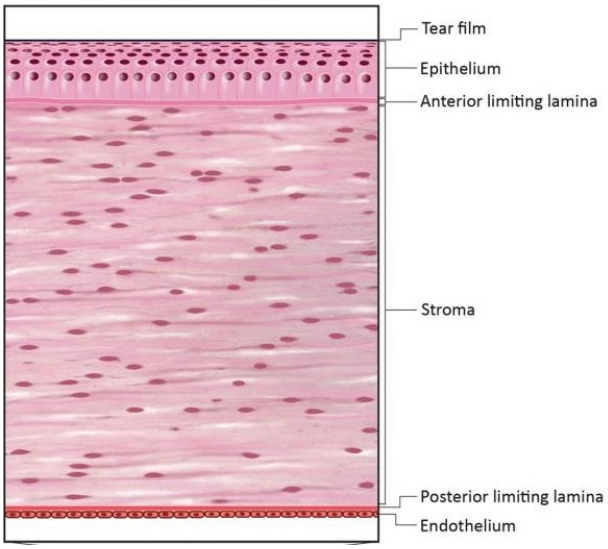

Figure 1: Diagram of the corneal structure in transverse section. (Diagram is not to scale) Copyright BCLA 2021

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1. History & symptoms considerations for wear

This initial step is essential to help inform lens recommendation, assess likelihood of success and the presence of risk factors for complications. It should include: **reasons for wear, past contact lens use, ocular and systemic health information, medications, refractive error, lifestyle, hobbies.**

What is known

- The following can impact the chance of achieving successful, comfortable contact lens wear; identification of which can inform patient counselling, lens recommendation and management of any co-existing pathology:
  - **Baseline symptoms of ocular discomfort without lens wear;** best reviewed in conjunction with tear quantity and quality measures[7,8]
  - **Medications** that can impact the tear film see BCLA CLEAR Evidence-Based Contact Lens Practice Report
  - **Presence of *Demodex*** (associated with higher dropout)[9]
- **Presence of the following risk factors for corneal infiltrative events** (CIEs) can inform recommendation of **daily disposable**, rather than reusable soft contact lenses:[10]
  - Patient age (<25 years; >50 years), prior history of CIEs, increased lid margin bioburden from blepharitis or meibomian gland dysfunction (MGD), certain health conditions (thyroid disease, self-reported poor health), history of smoking, poor hygiene.

What is not proven

Other than consideration of oxygen transmissibility for high refractive error or overnight wear, **little evidence is available to inform soft lens material choice** (hydrogel vs silicone hydrogel, SiHy)

2. Anterior eye exam

This is required prior to fitting contact lenses and at each aftercare visit and should include: **assessment of anterior eye physiology and tear film using slit lamp biomicroscope and diagnostic dyes**.[10] Digital image capture should be considered to enhance record keeping, grading, management, and patient education.[10]

What is known

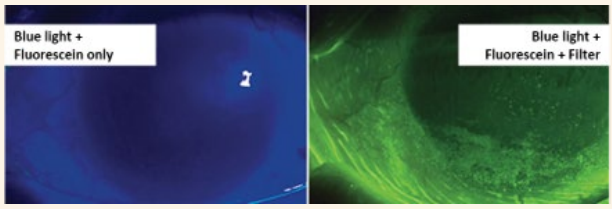
- **Video topography** provides a more complete profile than keratometry alone and is recommended as a baseline measure, to determine whether the eye could be fit with standard (commercial) lenses, to detect conditions such as keratoconus and is required when fitting ortho-k
- **A grading scale should be referred to at every visit,** to grade key metrics such as bulbar, limbal and palpebral hyperaemia and palpebral roughness (best imaged with fluorescein instilled^) in 0.5 increments, along with recording via appropriate diagrams, the extent of corneal and conjunctival staining
- Test order should be from **least-to-most invasive**, starting with the tear film, and finishing with addition of diagnostic dyes, lid eversion and meibum assessment

What is not proven

- **Aetiology of lid parallel conjunctival folds (LIPCOF) remains unknown;** model proposed of increased friction between the eyelid and ocular surface or contact lens.[11] They are considered a fair to significant predictor of contact lens discomfort[10]
- **A relationship has not been established between lid wiper epitheliopathy (LWE) and contact lens discomfort**[11]

Clinical Tip! Optimal dye use^:

- **For corneal staining** wet a single use paper strip with saline, shake off excess and instil a minimum amount of fluorescein; view ocular structures 1-3 mins later with an appropriate blue light **and a yellow (cut-off) filter**



- **Conjunctival damage and LWE** are best viewed 1-5 mins post 2 drops from 2 paper strips instillation of lissamine green retained on the strip for at least 5 secs to increase the concentration. If using fluorescein, wait 3-5 minutes before viewing. Care should always be taken to avoid touching the upper lid wiper area while everting the lid

3. Lens selection

Lens selection depends on many factors. Desired wearing schedule and refractive status can inform the type of contact lens as summarised in Table 2. Cosmesis, as an alternative to spectacles, is the most common reason to wear lenses, but in some cases medical need may drive their use, with reasons including high refractive error, irregular astigmatism and ocular surface disease.[6]

What is known for soft lens selection

- **Corneal topography alone does not inform** soft lens fit because fit is dependent on the sagittal height of the cornea and the contact lens; mass-produced soft lens base curves (back optic zone radii, BOZR) can adequately fit only **75-90%** of eyes [12,13]
- **Comfort** can be affected by the **coefficient of friction,** and more so by the **lubricity** of the material,[14,15] but is **not** linked to increased oxygen transmissibility[14]
- **Daily disposable use reduces CIE risk,[16,17] severity of microbial keratitis (MK),[18,19] and ocular allergy symptoms[20]** compared to reusable soft contact lenses
- **For multifocal fits, sensory dominance** should be determined to inform initial lens selection, and manufacturers report high multifocal fit success when lens fitting guides are followed

What is known for RCL selection

- Compared to soft lenses, RCLs may be better tolerated by patients with **dry eye or papillary conjunctivitis**,[21] and fewer **contact lens-related complications** occur with RCLs
- Corneal topography (typically keratometry) is used for BOZR selection
- Some evidence shows that **larger diameter RCLs** are more comfortable for adapted wearers,[22,23] but do not aid the adaptation process

See BCLA CLEAR Scleral and BCLA CLEAR Orthokeratology reports for selection criteria and fit assessment (section 4) for these lens types

Table 2: Contact lens suitability by desired wear and refraction

	Soft	RCL	Scleral	Ortho-K
Patient motivation				
Full time wear	✓	✓	✓	✓
Part time wear	✓			
Planned or sporadic overnight wear	✓ SiHy	✓	✓ With medical indication	✓
Correction free in day				✓
Patient Prescription				
Spherical	✓	✓	✓	✓ For myopia, may be full or partial correction depending on prescription and lens design
Astigmatic Rx	✓ Toric ≥0.75DC	✓ Spherical or toric design depending on corneal vs. total astigmatism	✓	✓ Depends on total power of steepest meridian, plus consideration of corneal and total astigmatism
Presbyopic	✓ Multifocal preferred; monovision possible	✓ Multifocal preferred; monovision possible	✓ Multifocal preferred; monovision possible	Monovision may be possible; currently no approved presbyopia correcting designs
Myopia management	✓ Approved designs; (or off-label use of centre distance multifocal)			✓ Maximum treatable prescription of approved designs varies
Patient related factors				
• Evidence for soft and RCL suitability for common health conditions, lifestyle, medications and ocular surface health can be found in tables 2 and 3 of the BCLA CLEAR Evidence Based Contact Lens Practice Report				
• Scleral lenses are most commonly used for primary corneal ectasia, ocular surface disease and post-penetrating keratoplasty[3]				

What is not proven

- Pupil size has **not** been shown clinically to affect the performance of **multifocal soft contact lenses**[24]
- **Very little evidence published that informs lens diameter choice,** although it is thought important to avoid mechanical insult of the limbal area by the lens edge
- There is **no literature** suggesting vertical palpebral aperture (VPA) is relevant to contact lens fitting
- **There is no clear association between wettability and comfort. The exact role of interactions between material, tear film and solutions, and whether biocompatibility can be improved by altering them remains debatable**[25]
- See BCLA CLEAR Contact Lens Wettability, Cleaning, Disinfection and Interactions with Tears Report

4. Evaluation of fitting

Accurate assessment of lens fit a crucial step in any contact lens examination because poor fitting lenses can impact ocular physiology and comfort which in turn is associated with drop out. Soft lens fit should be accurately assessed after 10 mins (Figure 2), along with measures of visual performance.

What is known for soft lenses

- Assess rotational position and stability of toric lenses
- **Multifocals:** Predicting visual performance of multifocals with standard visual acuity tests has been suggested to be inadequate and **vision assessment is recommend using real-world tasks. One multifocal design does not work for all patients, and initial fit performance may not predict long term performance**
- **Toric and multifocal designs perform well visually**. Some reduction in low contrast visual acuity expected with multifocals although **little difference in high contrast distance vision** with some soft multifocals compared to single vision lenses[26]
- See BCLA CLEAR Optics Report

What is known for RCLs

- Optimum window for observation of fluorescein pattern is 30 seconds to 3 minutes post-instillation
- **Revised scheme for standardised recording of RCL fit proposed** that includes rating subjective comfort, and grading lens coverage, dynamic centration, movement and fluorescein fitting pattern[10]

5. Prescribing

Following any required changes to lens power or fit, and after a suitable length of trial, the final lens choice can be prescribed. This involves several areas, many of which may routinely be undertaken by delegated trained staff members. This stage of the patient journey should include: **advising on initial adaptation period and plan for follow up; plus introduction to safe wear and care procedures with time to practice new handling techniques**.

What is known

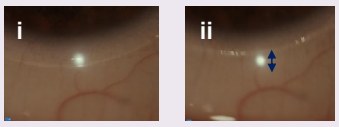
Adaptation

- Modern soft lenses can be worn successfully **without the need** to build up wearing hours
- RCL require longer adaptation: 1-3 weeks on average
- Multifocals require visual adaptation; can take up to 2 weeks

Simplified, standardised recording of soft lens fit

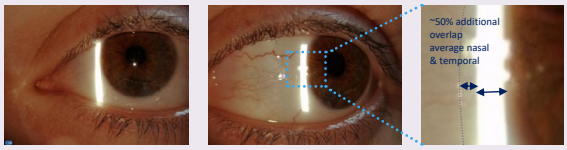
Primary predictive measures of overall soft lens mobility:[27]

1. Post blink movement in up gaze (**B** 0.25-0.50 mm)



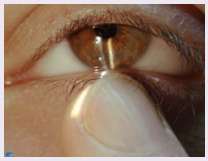
i) Pre-blink
ii) Displacement immediately after blink

2. Horizontal lag (**L** 50-100% change in overlap of the lens onto the limbus)



Adjust slit width to overlap in primary gaze; then move same slit to assess overlap in horizontal gaze

3. Push-up recovery speed (**P** 2-4mm/s/non-sluggish, visible recovery)



Push up lens to cross lower limbus and watch recovery speed

Record on a fitting cross using a 3 point scale + (more), 0, - (less), combine with marking lens centration and a subjective 0-10 comfort score from the patient. **Example:**

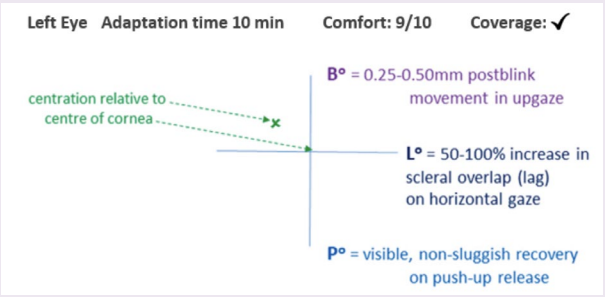


Figure 2: Simplified assessment and recording of soft lens fit[27]

Top Tip for multifocals! Note that visual performance, ocular physiology, pupil size, ocular aberrations, lifestyle and personality are all poor indicators of which multifocal a patient will prefer:[24] **patients need to try them, ideally with real-world visual targets, and be aware you have alternatives to optimize the result!**

Teaching self-application and removal

- Difficulties with handling cited as a key reason for drop out by new wearers [28 29] but there is a **general lack of evidence surrounding current patient training practices.** For example, the requirement to demonstrate competency by removing and applying a lens three times appears arbitrary
- Verbal instructions should be supported with **written information,** with early, possibly remote, follow up advice for new wearers

Care regimen and cleaning

- Decision of care regimen not based on efficacy alone but also **ease of use and comfort**
- **Hydrogen peroxide 1-step systems** seem to promote more favourable compliance, efficacy, comfort and ocular surface outcomes[30] and should be considered by ECPs as a **first-line, as well as a troubleshooting option,** for patients
- The need for a **mechanical rub** with multipurpose disinfecting solutions (MPDS) has been well established
- Guidance on lens case maintenance from professional bodies and solution manufacturers may be contradictory; replacement advice varies between 1-3 months and few mention the need to rub and store cases face down
- Case care is often not covered by manufacturer's guidelines and **ECPs should outline the necessary steps: no tap water, manual rubbing/wiping of empty case, air drying face down and ideally avoid storing in humid places like bathrooms**

Compliance/minimising risks

- There is a discrepancy between information ECPs believe to have provided patients and what patients recall hearing - **provide written material** and links to online sources[31]

What is not proven

- **Key point: There is a general lack of evidence surrounding current patient training practices and lens case replacement frequency. Future research is required to optimise these areas**

6. Aftercare

Aftercare visits provide a valuable opportunity to not only assess contact lens fit, vision and ocular physiology, but also to elicit any dissatisfaction in lens performance - especially comfort - that could be improved with an alternate lens, care regimen or management of any co-existing ocular pathology. The aftercare routine should include: **changes from previous visit, review of lens brand and care system (photos helpful); lens comfort, vision, lens fit, examination of the tear film and ocular surface, and assessment of compliance with appropriate reminders as required.**

What is known

Recommend frequency for **routine** follow up, which may need to be adjusted based on patient need and regional regulatory guidance:[32]

- More frequent initial (remote) follow up for new wearers, focus on handling, vision, comfort
- 24 months has been suggested as suitable for daily disposable,[32] although local regulatory guidance and ECP preference may recommend 12 months
- 12 months for soft daily wear reusable and RCL
- 6 months for soft and RCL overnight wear
- **Adjust for progressing myopes and presbyopes where prescription change may be more rapid**

BCLA CLEAR Effect of Contact Lenses on Ocular Anatomy and Physiology Report[11]

- **Rarely seen: corneal hypoxia and papillary conjunctivitis** (can be improved with more frequent lens replacement)
- **Continue to monitor: bulbar conjunctival hyperaemia and ocular surface staining** as non-specific indicators of the physiological impact of contact lens wear
- Although their significance and/or clinical management is not well understood, **be aware of blinking, LIPCOF, LWE, interactions between contact lenses and meibomian glands**
- **The future:** expect increasing use of soft/ortho-k optical designs for myopia management, along with increased understanding of how the sub-clinical inflammatory response to lens wear may help to explain mechanisms/predict certain physiological responses, adverse events and contact lens discomfort

What is not proven

There have been **no prospective studies of corneal infection (MK) since the mid-2000s**, and therefore there is no reliable estimate of incidence with contemporary lenses, ortho-k and soft myopia control lenses,[33] however some longer term data on adverse events is starting to become available for myopia management trials[34]

BCLA CLEAR Complications Report

Contact lens related complications affect **about a third** of wearers; **most are easily managed**[35] and can be classified as:

- Corneal infection (eg: MK)
- Corneal inflammation (eg: CIEs)
- Metabolic conditions (eg: neovascularisation)
- Mechanical (eg: corneal abrasion or erosion, SEAL)
- Toxic and allergic disorders (eg: CLIPC, SICS)
- Tear resurfacing disorders/dry eye (eg: CL induced dry eye (CLIDE), LWE, LIPCOF)
- Contact lens discomfort

Tips for lowering risk of corneal infection: avoidance of overnight wear, attention to hand, lens and case hygiene, daily disposable lenses, daily wear RCLs, and encourage patients to present early to an ECP

Contact Lens Discomfort

- **CLIDE -** symptomatic contact lens wearers who become asymptomatic after contact lens removal
- **CLADE -** contact lens associated dry eye: pre-existing dry eye among contact lens wearers who are symptomatic regardless of lens wear

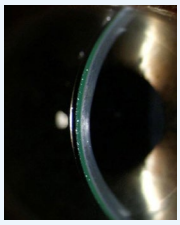
Meibomian glands

- Increased signs of MGD are associated with contact lens dropout, and signs of MGD are a predictor for worsening symptoms
- The impact of changes in MG structure in contact lens wearers detected by meibography are inconclusive, but meibum expressibility and quality are altered **- recommendation for ECPs to be proactive and manage early clinical, possibly asymptomatic, signs of MGD in contact lens wearers**

Management of discomfort

- Evidence exists to support **switching lens care products** or refit to **daily disposable** to help improve lens comfort
- Other options include: **artificial tears, lid hygiene, refitting with alternate lens;** if symptoms cannot be controlled consider **scleral or ortho-k**

BCLA CLEAR Scleral Lens Report



Midday fogging (fluid reservoir debris) is the most common complication of scleral lens wear (26-46% of patients), although the exact aetiology and composition of this particulate matter is unknown. Reservoir debris has been linked with leukocytes, lipids, and external tear film debris. **Oxygen deprivation** to the cornea occurs even with high Dk materials due to the oxygen permeability of the fluid reservoir[3]

Horizon-scanning highlights from the BCLA CLEAR Contact Lens Technologies of the Future Report[35]

Future innovations move **beyond** correction of refractive error, with some examples either currently (optical designs for myopia management; IOP measurement), or shortly (antihistamine-releasing contact lens) available.

Contact lenses are being developed for the **detection, monitoring and treatment** of both **ocular** (eg: glaucoma, dry eye disease) and **systemic disease** (diabetes, detection of cancer markers). Some technologies will perform one of these functions, with the field of theranostics potentially combining the monitoring and treatment of certain conditions into one device.

Further advances focus on **enhancing safety** via antimicrobial lenses, and innovation in lens storage cases and packaging. The addition of electronics to contact lenses not only leads to the possibilities of **augmented vision,** but to the design of lenses that may be able to automatically focus at different distances for **presbyopes,** or provide enhancement to patients with **low vision**.

All ECPS should be aware of advances in the medical use of contact lenses.[6]

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This BCLA CLEAR summary was commissioned by BCLA in partnership with CORE Centre for Ocular Research & Education