Elara 900 white paper series – clinical observation

User experience and usability evaluation report – congress questionnaire data and pre-launch clinical observations with a new type of slit lamp.

This white paper was prepared by Haag-Streit AG in March 2026. The Heidelberg evaluation was conducted in collaboration with the International Vision Correction Research Centre (IVCRC) at Heidelberg University Hospital. All data are held on file by Haag-Streit AG.

Key takeaway points

- The introduction of the Haag-Streit Elara 900 slit lamp also introduced a new technology for the illumination unit. Preliminary user feedback consistently indicated an improvement in visual perception, forming the basis for the hypothesis that illumination-driven contrast enhancement could be an additional factor in clinical observations using slit lamp biomicroscopy, which needed to be further investigated
- Two subsequent congress-based user questionnaires (n = 58) showed that 77.6% of respondents reported improved binocular visualization with the Elara 900 compared to the BQ 900. Meanwhile, 22.4% reported no difference, and none reported poorer visualization
- The combined subjective ratings favored the Elara 900 in terms of optical precision, image detail resolution, and illumination quality. The clearest separation was observed in the dataset obtained during the user tests conducted at the 2025 Royal College of Ophthalmologists (RCO) Annual Congress
- Another clinical project was conducted at the International Vision Correction Research Centre at the Heidelberg University Hospital during the pre-launch clinical device test (pilot phase). The reported results (n = 20) showed that 100% of respondents rated the overall imaging quality as superior, 75% preferred the Elara 900 for fundus visualization, and 90% selected the Elara 900 as their preferred device when compared to the Haag-Streit BQ 900.

Introduction

Slit lamp biomicroscopy remains the primary visual examination technique in ophthalmology. The Elara 900 was developed to enhance this modality with a projector-type illumination ("P-Type") concept, integrated digital imaging, and a "preset"-driven workflow. The Elara 900 enables the dynamic modulation of spectral output thanks to its distinct RGB light source and digital light processing (DLP) unit[1]. This allows the illumination unit to project light and patterns across the entire visible spectrum, enabling control of individual pixels rather than forming beams of light via an aperture, as in classic slit lamp illumination designs.

The illumination unit can be set to three different white light color temperatures (3100 K, 5000 K, and 6000 K), reflecting the three main light sources currently used in light fittings: halogen, LED, and tungsten.

This spectral flexibility enables the Elara 900 to target potential tissue contrast enhancements depending on the clinical application. Unlike conventional slit lamp illumination systems with fixed spectral distributions, the Elara 900 enables task-specific spectral adaptation, which could improve the visualization of both superficial and deeper ocular structures.

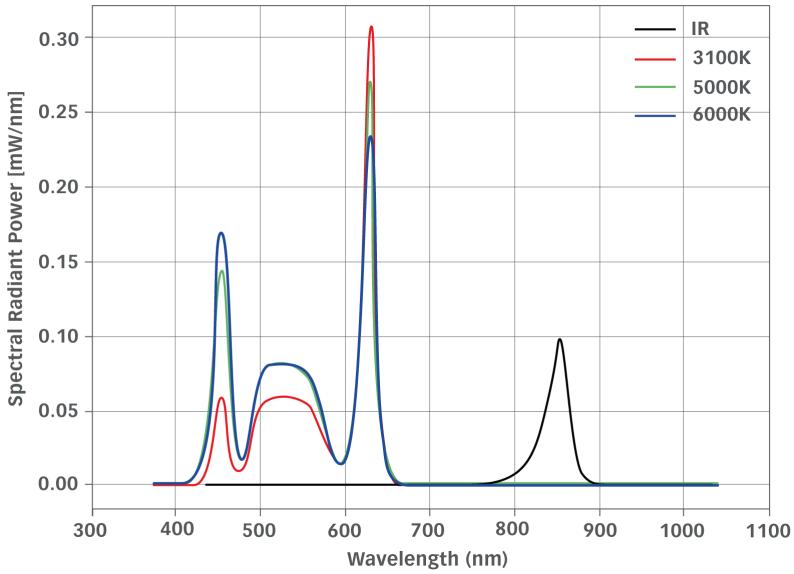

Figure 1: Spectral power distribution of the Elara 900 DLP-based illumination system featuring infrared capabilities[1]

The Elara 900's DLP-based RGB illumination system enables the spectral and spatial modulation of light for specific tasks. It is therefore hypothesized that this adaptive illumination approach enhances the detection and interpretation of subtle anatomical features by improving tissue-specific contrast compared to conventional slit lamp systems with fixed-spectrum illumination, such as the Haag-Streit BQ 900.

Objective

To investigate this hypothesis, usability tests were conducted in real-world settings in 2025. These included user-based assessments at the American Ophthalmology Meeting, “Telling It Like It Is”, in Florida, USA, and at the Royal College of Ophthalmologists (RCO) Annual Congress in Liverpool, UK. Structured observations were also conducted at the Heidelberg University Hospital in Heidelberg, Germany.

These projects aimed to evaluate whether the proposed illumination-driven enhancement results in tangible improvements in clinical observation, as indicated by user-reported visualization quality and the capacity to identify subtle anatomical features during routine examinations.

Methods

This structured usability evaluation was conducted across multiple settings to gather user feedback on the impact of adaptive illumination during slit lamp examinations, compared to non-adaptive illumination.

This evaluation was devised to test the possibility that dynamic RGB-LED-based spectral illumination enhances the visualization of ocular structures, regardless of the performance of the optical system. The test devices included a Haag-Streit Elara 900 slit lamp and a Haag-Streit BQ 900 slit lamp with LED illumination.

To ensure the user perceptions were applicable to a broad range of clinical experience and subspecialties, participants were selected to reflect this diversity. The users included board-certified ophthalmologists, ophthalmology residents, and fellows.

User feedback was gathered across several dimensions. The primary areas of interest were visibility of anatomical structures, contrast perception, and detection of subtle features. Secondary feedback covered ease of visualization, overall examination experience, and device preference relative to conventional slit lamps.

Evaluation protocol

Participating users performed structured slit lamp examinations using both systems. They were permitted to use predefined illumination "presets" and adjust the illumination settings within a typical clinical workflow. This approach strikes a balance between standardization and real-world usability.

Setting

Assessments were performed in three complementary environments during the pre-launch pilot phase. To facilitate consistency, all examinations were conducted in dedicated, private evaluation rooms to minimise external distractions and enable standardized testing conditions.

Three evidence streams were used. The first dataset (n = 38) comprised questionnaire results obtained during the RCO 2025 Congress in the UK. This dataset was reviewed with input from Dr. Sunil Mamtora (UK).[2,9]

The second dataset (n = 20), comprising questionnaire results, was collected at the "Telling It Like It Is" meeting in the USA.[3]

The third evidence stream formed part of a pre-launch pilot project conducted with the International Vision Correction Research Centre (IVCRC) at Heidelberg University Hospital and led by Professor Gerd U. Auffarth. He and his team conducted comparative user assessments and timed examinations following a structured in-clinic rotation design, comparing the Elara 900 with a traditional slit lamp using LED illumination under routine clinical conditions.[4]

The questionnaire domains used for the quantitative evaluation included overall binocular visualization, optical precision, image detail resolution, and illumination quality. Satisfaction responses were coded on a five-point ordinal scale ranging from "very dissatisfied" (1) to "very satisfied" (5) for descriptive comparison. Internal data were treated as exploratory, non-randomized empirical findings.

Results

Congress questionnaires: overall binocular visualization

Combining the two congress datasets, 45 out of 58 respondents (77.6%) reported improved binocular visualization with the Elara 900 compared to the BQ 900, while 13 out of 58 (22.4%) reported no difference. In the "Telling It Like It Is" meeting dataset, 70.0% of respondents reported improved visualization, compared to 81.6% in the RCO dataset.[2-3]

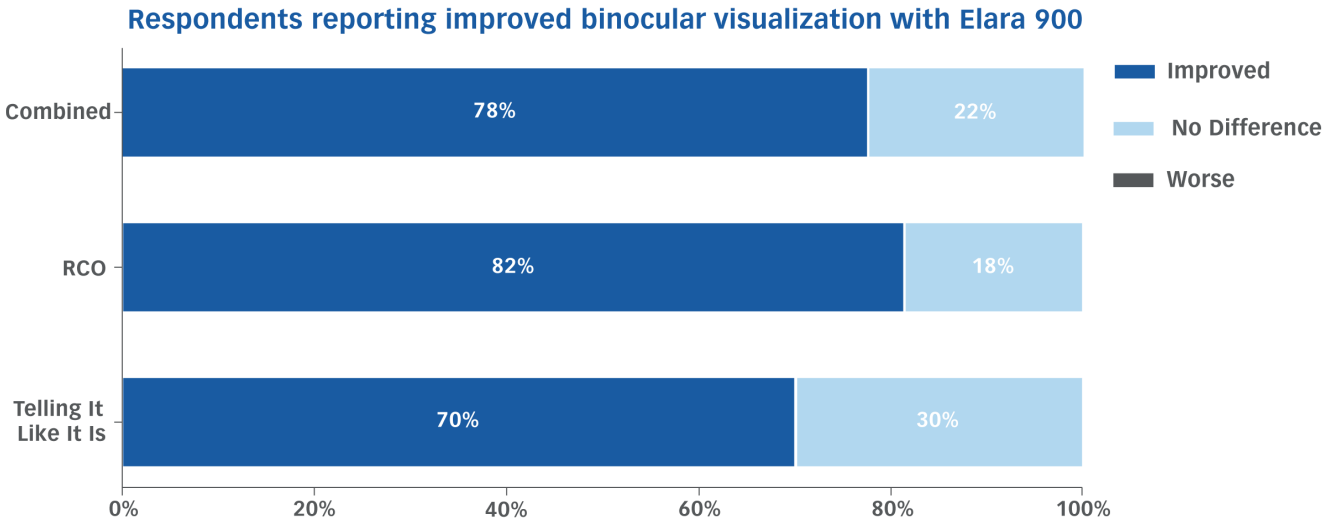

Figure 2 Share of respondents reporting improved binocular visualization with Elara 900 versus BQ 900 across congress questionnaire datasets ("Telling It Like It Is" Congress n = 20; RCO Congress n = 38; combined n = 58)

Congress questionnaires: subjective domain ratings

When the ratings from the two congress datasets were pooled, the Elara 900 achieved higher mean scores than the BQ 900 for optical precision (4.70 vs. 4.38), image detail resolution, (4.64 vs. 4.39) and illumination quality (4.69 vs. 4.38). The RCO dataset showed the clearest separation, whereas the "Telling It Like It Is" meeting dataset was highly positive for both devices and therefore less discriminative.[2-3]

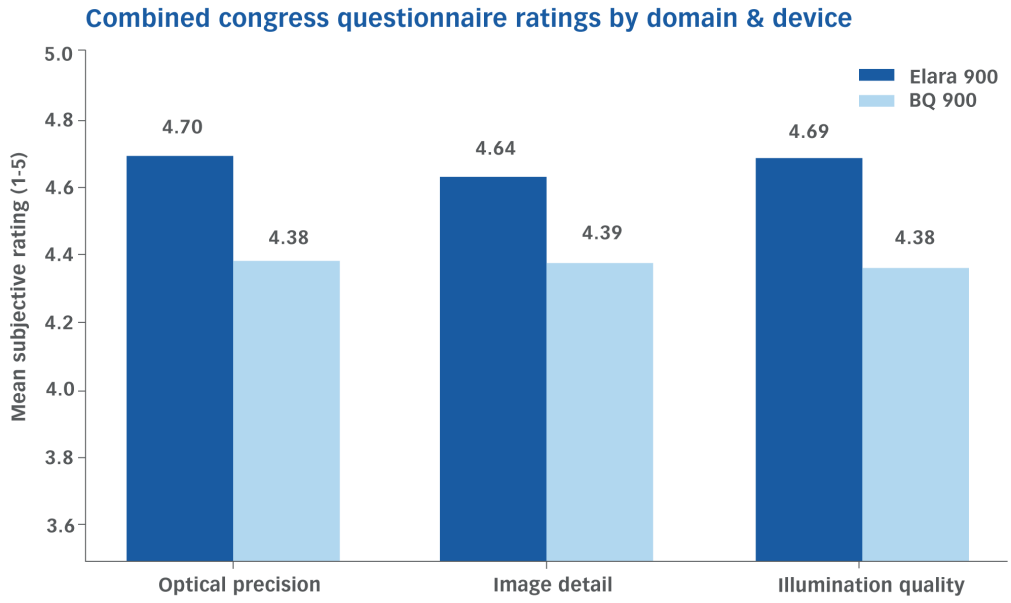

Figure 3: Mean ratings from the combined congress questionnaire on a five-point satisfaction scale for the Elara 900 & the BQ 900, across three clinical observation domains

A similar pattern emerged from the top-box analysis. The proportion of respondents who selected "very satisfied" was 69% for the Elara 900 versus 35% for the BQ 900 in terms of optical precision, 64% versus 40% for image detail resolution, and 71% versus 40% for illumination quality.[2-3]

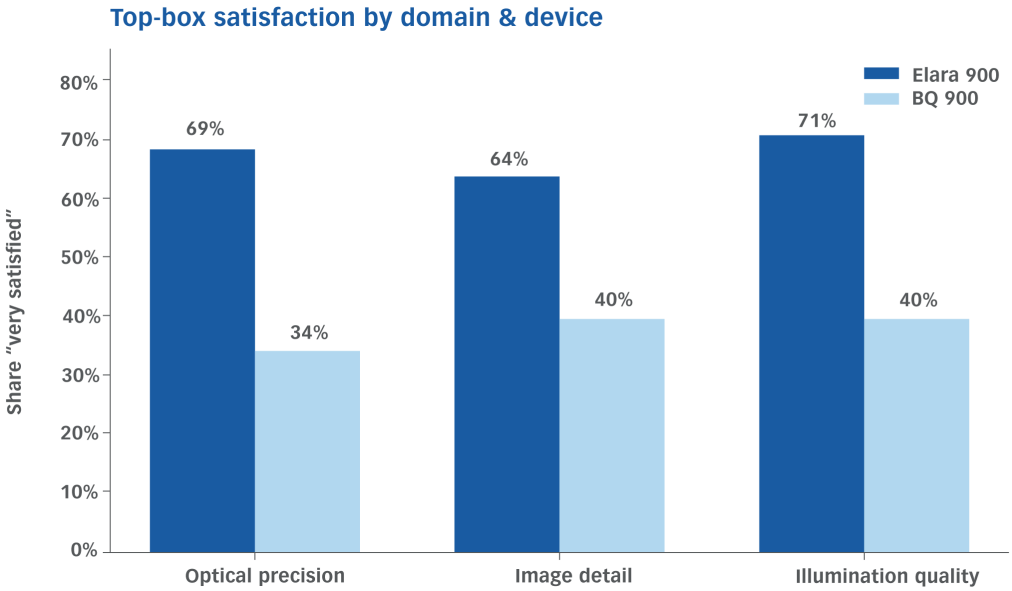

Figure 4: Share of top-box ("very satisfied") responses across the combined congress questionnaire datasets

Report of the IVCRC at the University clinic Heidelberg: comparative outcomes

In the assessment conducted by Prof. Auffarth, 20 questionnaires were completed after users had familiarized themselves with the Elara 900 in a routine clinical setting. This report found that 100% of respondents rated the overall imaging quality as superior, 75% preferred the Elara 900 for fundus visualization, and 90% selected the Elara 900 as their preferred device when compared to the Haag-Streit BQ 900.

These improvements were primarily attributed to enhanced contrast perception and illumination characteristics. Meanwhile, optical performance was perceived as being comparable between the devices.

Discussion

The spectral characteristics of the Elara 900 illumination system provide a mechanistic explanation for the observed improvements in clinical visualization. As shown in Figure 1, the RGB-LED-based system enables modulation of spectral peaks at discrete points across the visible and infrared spectrum. This allows clinicians to adjust the relative contribution of light at different wavelengths during an examination.

This capability has direct implications for tissue interaction. Shorter wavelengths (in the blue spectrum) increase scattering at the surface of tissues, making corneal microstructures and tear film irregularities more visible. Conversely, longer wavelengths penetrate deeper into ocular tissues, improving the visualization of subretinal and vascular structures.[6]

Unlike conventional slit lamp illumination systems, which rely on fixed-spectrum light sources, the Elara 900 enables real-time dynamic spectral adaptation. This represents a shift towards functionally adaptive visualization, where light is actively optimized for the diagnostic task.

These findings are consistent with the improvements in contrast perception and subtle finding detection reported by users, suggesting that illumination control may represent a meaningful and independently valued dimension of slit lamp usability.

This pattern aligns with the broader literature showing that the quality of slit lamp biomicroscopy is linked to wavelength-dependent tissue interaction, which can influence the interpretation of diagnoses in ophthalmology.[5-8]

Limitations

The present findings are exploratory and are intended to provide indicative, rather than definitive, evidence. The results are based on subjective user assessments and were not quantified using standardized clinical endpoints. Consequently, objective measures of diagnostic sensitivity or specificity are unavailable.

Despite these limitations, the data consistently suggest an improvement in contrast perception and visualization of subtle anatomical structures. These findings provide a compelling case for conducting more representative, structured studies that systematically evaluate the Elara 900's performance across specific ocular pathologies. Such studies could assess detection rates, inter-observer agreement, and diagnostic accuracy in a controlled environment.

Conclusion

The findings of this assessment suggest that, despite having comparable optical systems to conventional slit lamps, the Elara 900 facilitates a consistent improvement in visual examination as perceived by the user. This implies that illumination, specifically the capacity to dynamically adjust the spectral composition of light, could be an additional, clinically significant factor influencing clinical observation quality in slit lamp biomicroscopy.

The results indicate that adaptive illumination can enhance contrast perception and facilitate the visualization of subtle anatomical structures, thereby extending the capabilities of clinical observation. Although further structured studies are needed to quantify these effects across specific conditions, the current data provides a foundation for innovation driven by illumination in ophthalmic diagnostics.

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