Enhanced Macular Imaging Referral Pathway: Integrating Community Optometry and Hospital Eye Services with Telemedicine

*We developed a system that lets community optometrists share detailed eye scans with hospital specialists, **reducing unnecessary hospital visits and speeding up care** for macular disease.*
This approach improves efficiency, ensures faster treatment for those who need it, and sets the stage for future technological developments.

Contact me: serena.salvatore@uhbw.nhs.uk

Purpose

The National Health Service (NHS) in the United Kingdom faces unprecedented challenges in delivering ophthalmology services. Hospital Eye Services (HES) have seen a significant rise in demand, with ophthalmology being the largest outpatient speciality, accounting for 7.5 million attendances in 2021-22. This surge in demand is primarily due to an ageing population, advancements in diagnostic imaging technologies, and expanded screening programs. To tackle these challenges, the NHS Long-Term Plan emphasises digital service transformation. At University Hospitals of Bristol and Weston, an enhanced macular imaging referral pathway was implemented to integrate community optometry with hospital care. This pathway allows community optometrists to share fundus images and Digital Imaging and Communications in Medicine (DICOM®) optical coherence tomography (OCT) files with hospital clinicians for review, facilitating detailed evaluation and improved referral management.

Authors

Salvatore, Serena[1]; Harvey, Josh[1]; Hughes, Amy[2]; Gibson, Lisa[2]; Hopcroft, John[3]; Swift, Sarah[1]; Marsterson, James[1]; Bailey, Clare[1]

Affiliations

1. University Hospitals of Bristol and Weston, Bristol Eye Hospital, Bristol, Bristol, United Kingdom.
2. Primary Eyecare Services, United Kingdom.
3. Avon Local Optical Committee, United Kingdom.

Methods

This retrospective cohort study analysed 376 consecutive patient referrals received through the enhanced macular imaging referral platform between July 2024 and March 2025 at the University Hospitals of Bristol and Weston NHS Foundation Trust. Key metrics included referral appropriateness, subspecialty redirection rates, and hospital appointments saved. Data collected included patient demographics (age, gender, ethnicity), imaging completeness, appropriateness of referral, redirection to alternative subspecialties, and final management decision (discharge, teleophthalmology 'virtual' review, in-person hospital appointment, or nAMD pathway with urgent call to discuss treatment).

Outcome Measures

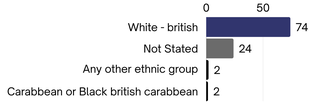
- **Hospital appointments saved** (proportion of referrals that saved an in-person hospital appointment)
- ***Appropriateness of referrals*** (proportion of referrals deemed suitable for the intended subspeciality pathway)
- ***Subspecialty redirection rates*** (proportion of referrals redirected to alternative subspecialties)

Descriptive statistics were used to summarise the data. Continuous variables were presented as median with interquartile range (IQR), and mean ± standard deviation (SD) as appropriate.

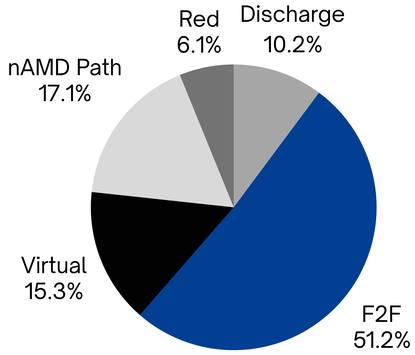
Results

The median age of referred patients was 74 years (IQR: 14 years), with 54.26% female and 73.94% White-British. **A total of 241 referrals (73.7%) resulted in saved hospital appointments.**
Of the 376 referrals, 327 (86.97%) were deemed appropriate for macular assessment, while 49 (13.03%) were considered inappropriate due to incomplete imaging (18 cases), or redirection to another subspecialty (31 cases). Among the redirected cases, the majority (27 cases) were referred to vitreoretinal services, with the remaining cases distributed to paediatric ophthalmology (1 case) and other (2 cases).

Ethnicity

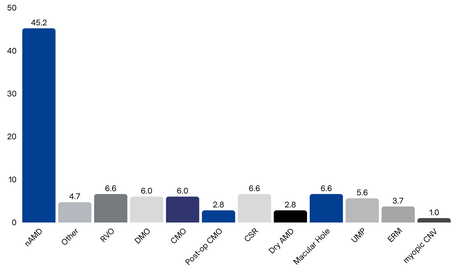


Management Decision



Red: Redirected; F2F: Face to face.

Referral pathology



Analysis of 106/376 cases for referral pathology.
nAMD: neovascular AMD, RVO:Retinal Vein Occlusion, DMO: diabetic macular oedema, CMO:cystoid macular oedema, post-op CMO: postoperative cystoid macular oedema, CSR: central serous retinopathy, UMP: Unknown macular pathology, ERM:epiretinal membrane, CNV: choroidal neovascularisation.

Conclusion

This study demonstrates the potential of digital referral pathways to **ease the strain on ophthalmology services** by improving diagnostic accuracy, accelerating treatment, and improving patient outcomes. With the ability to review twice as many cases per session vs traditional face-to-face clinics, this model delivers significant efficiency gains without compromising care quality. The reduction in hospital visits enables better resource use, while AI-driven tools could further streamline triage and service delivery. The high speed of access for specialist opinions represents a dramatic improvement in service responsiveness. Additionally, avoiding unnecessary face-to-face appointments delivers **broader societal benefits through reduced carer time requirements and a smaller carbon footprint.** This model offers a scalable framework for other subspecialties, supporting the NHS's commitment to innovation and sustainable healthcare.

Related Literature

Baker, H., Harper, R. A., Edgar, D. F., & Lawrenson, J. G. (2018). Referral behaviour of community optometrists: Increase in the number of referrals from optometrists following the introduction of National Institute for Health and Care Excellence guidance. Eye, 32(11), 1836–1842.
Cameron, J. R., Ahmed, S., Curry, P., Forrest, G., & Sanders, R. (2021). Impact of direct electronic optometric referral with ocular imaging to a specialist ophthalmology service. Eye, 35(7), 2037–2042.
Faes, L., Wagner, S. K., Fu, D. J., Liu, X., Korot, E., Ledsam, J. R., ... & Keane, P. A. (2021). Automated deep learning design for medical image classification by health-care professionals with no coding experience: a feasibility study. The Lancet Digital Health, 3(4), e232–e242.

Financial Disclosures

Serena Salvatore: Commercial Relationships; Roche Products Limited, Bayer, Alimera Sciences| Josh Harvey: No Commercial Relationship | Amy Hughes: Commercial Relationships;Primary Eyecare Services| Lisa Gibson: Commercial Relationships;Primary Eyecare Services | John Hopcroft: No Commercial Relationship | Sarah Swift: No Commercial Relationship | James Marsterson: No Commercial Relationship | Clare Bailey: Commercial Relationships; Roche Products Limited, Bayer, Alimera Sciences, Abbvie, Boehringer Ingelheim.