



How well do we write for patients? A longitudinal analysis of the readability and complexity of 4.6 million ophthalmic clinical letters

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BACKGROUND

Effective clinician–patient communication is a fundamental pillar of high–quality clinical care, and can influence patient engagement, treatment adherence, and clinical outcomes. National policy has increasingly emphasised the importance of making these documents accessible and patient–centric (e.g. 2018 AoMRC guidance, *‘Please, write to me’*)

However, the extent to which clinical letters meet recommended readability standards remains largely unquantified. We aimed to **benchmark this at scale in an Ophthalmology setting** – the highest–volume outpatient specialty in the United Kingdom (UK).

METHODS

Over 4.6 million outpatient clinic letters written for 804,986 patients across 17 subspecialty services between 2013–2025 at Moorfields Eye Hospital Foundation Trust, UK.

Standard readability scores (including Flesch Reading Ease (FRE), SMOG Index, Automated Readability Index) were calculated for letters. Complex linguistic features such as lexical density and Type Token Ratio were also evaluated, and rule–based measures were applied to identify letters addressed directly to patients.

Using the FRE as the primary outcome, readability was compared across subspecialties,. Differences were assessed using the Kruskal–Wallis test, posthoc pairwise Dunn’s tests with Benjamini–Hochberg false discovery rate correction,, with Cliff’s delta for each comparison to provide an effect size estimate independent of sample size.

Temporal trends were evaluated using univariate linear regressions within each subspecialty, including year as a covariate.

Two synthetic letters based on real clinical correspondence to illustrate extremes of readability.

Flesch Reading Ease: 88.58 (6th grade reading level) SMOG Index: 9.12 Automated Readability Index: 6.63 Word count: 378 Subspecialty: Strabismus	Flesch Reading Ease: 8 (College graduate) SMOG Index: 33.89 Automated Readability Index: 49.13 Word count: 158 Subspecialty: AGE
Dear NAME, We met one week after the squint surgery in your left eye. The operation itself went very well, and the eye is healing as expected. There are no signs of infection or other problems. I was sorry to hear that you have had a lot of problems with double vision over the last week and have been keeping your left eye closed. The eye muscles are still slightly imbalanced, but with some effort, you were able to get your eyes straight and get single vision. I have encouraged you to do this as much as possible over the next two weeks, even if it feels difficult at first. This will help your brain to adjust. You should also continue to do some exercises where you look to the right side with your left eye 3–4 times a day. Please continue with the Maxitrol eye drops four times a day to your left eye. We will see you again in two weeks to see how you are getting on.	SM, extensive ENT surgical history for chronic inflammatory sinonasal disease complicated by postoperative cranial neuropathy (CN II/IV palsy) Developed left paracentral scotoma on DATE, progressing rapidly to dense centro-caecal defect with HM vision only in residual nasal periphery despite steroid therapy No retrobulbar pain, no pain on eye movement No associated sensory, motor, or autonomic symptoms Left eye asymptomatic Treated at UCLATH with IVMP followed by high-dose oral steroids for presumed inflammatory optic neuropathy CT orbits pre-steroids and MRI brain/orbits post-steroids on DATE, report awaited Examination today VA: RE HM NIDWP, LE 6/5 Right RAMP present Anterior segments quiet Disks and maculae appear normal; no swelling or vascular abnormality DCT RNP/LCL symmetric EDM full, no proptosis No additional focal neurological deficit Differentials Discussed with Neuro-ophthalmology on call: Atypical steroid-refractory optic neuritis vs retro-orbital/chiasmal compression vs late-onset hereditary optic neuropathy Investigations Bloods incl. inflammatory, infectious, autoimmune, demyelination screen HWF 24-2 requested Chase neuroimaging reports Referred to Neuro MDT

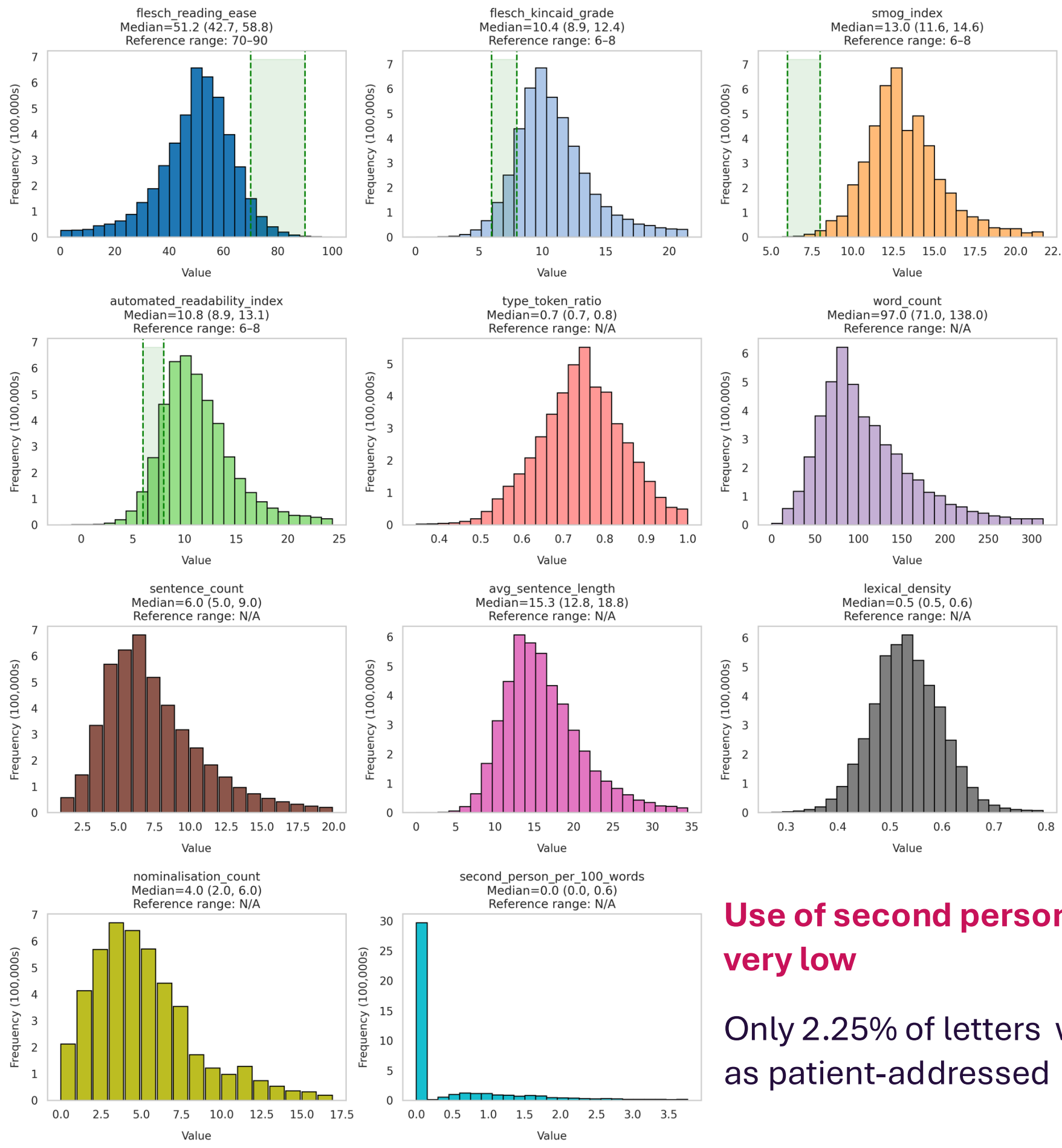
RESULTS

Overall, **readability was poorer than the recommended target range. 95.3% of letters fell below the FRE range**

FRE: Median 51.1 (worse than target 70-90 i.e. 10th grade reading level)

SMOG Index: Median 13.0 (worse than target 6-8)

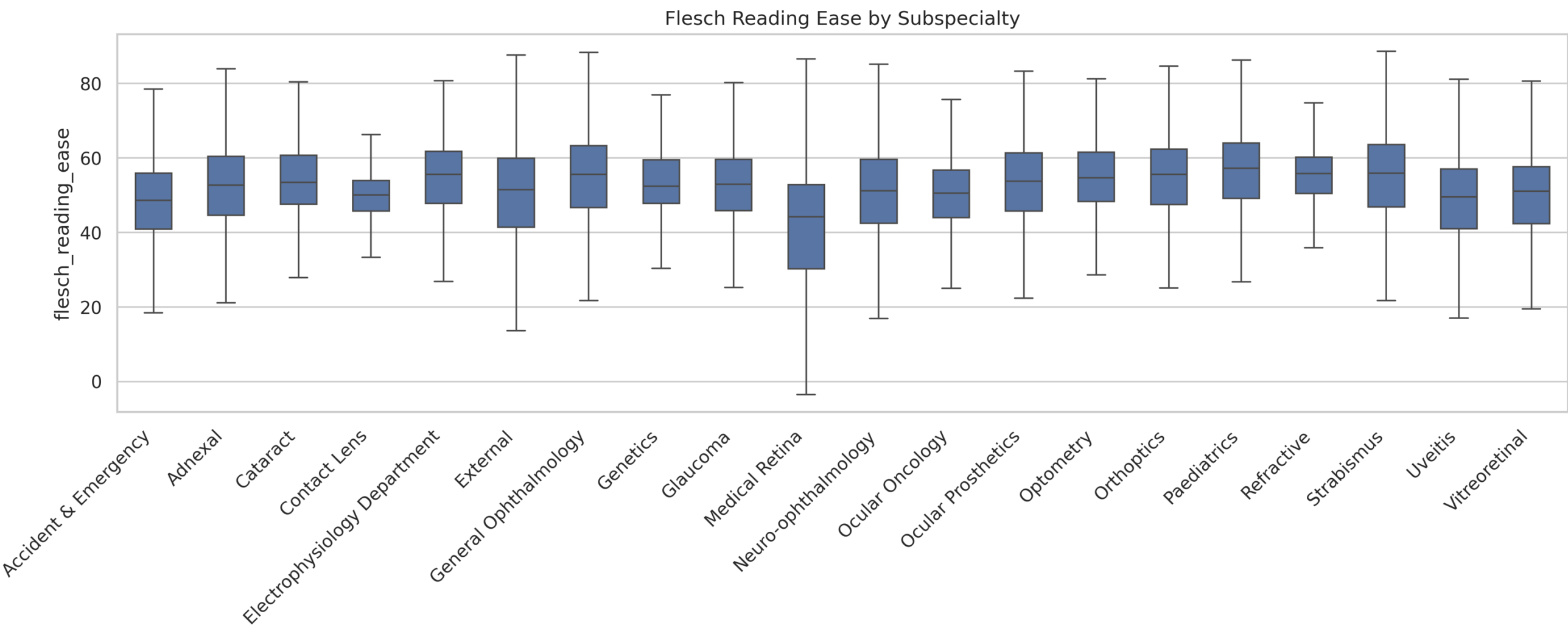
Automated Readability Index: Median 10.9 (worse than target 6-8)



Use of second person terms was very low

Only 2.25% of letters were classified as patient-addressed

Substantial differences in readability across subspecialty services (NB: lower scores indicate poorer readability)



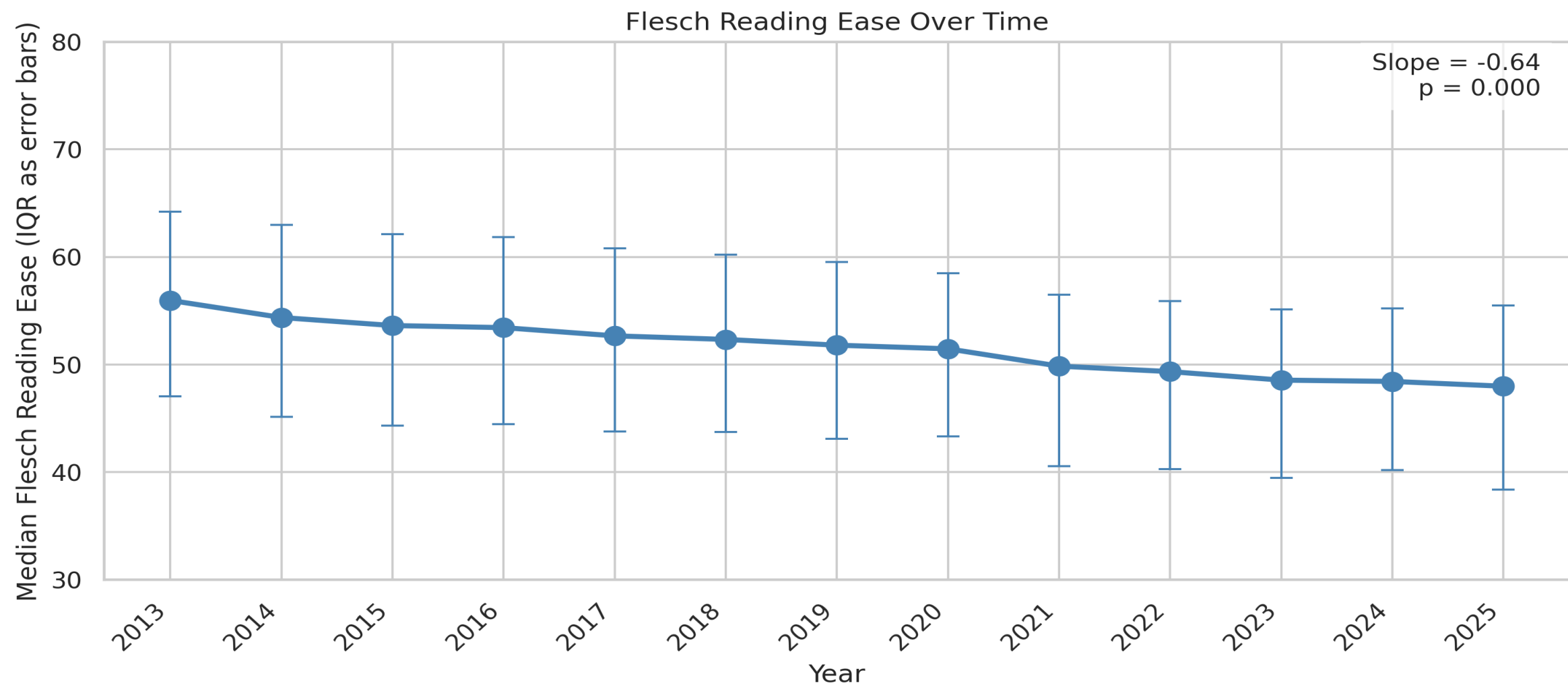
Pairwise effect size analysis showed that **Medical Retina consistently produced the least readable letters**, with medium-to-large negative effect sizes (δ -0.23 to -0.51) relative to all other services.

TAKE HOME MESSAGES

Clinical correspondence across ophthalmology services remained well above recommended readability thresholds and has become more complex over time, with substantial variability across subspecialty services.

There is a persistent gap between policy recommendations and real-world practice, underscoring the need for targeted interventions and innovative approaches (e.g. artificial intelligence tools, ambient voice technologies) to support clearer patient–centered communication to optimise outcomes.

There was a **significant decline in FRE over the study period from 2013-25** (-0.64 points/annum, $p < 0.001$).



Rate of change in FRE varied across subspecialty services

- Decline was **more pronounced in some such as neuro-ophthalmology** (-1.24 points/annum, $p < 0.001$)
- Few had a stable FRE score over time (e.g. Orthoptics, $p > 0.05$)
- None saw an improvement in readability score

