An assessment of inpatient ophthalmology referrals and the validity of PEEK visual acuity app in a real-life setting

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Introduction

Inpatient ophthalmic presentations encompass a diverse set of ocular pathologies with varying severities. Understanding the workload presenting to an ophthalmology department could allow more efficient service provision. Although described in the United States, to our knowledge no work describes the demographics of referrals to a UK ophthalmology department

A key component of a referral is the visual acuity of the patient in question. Given its importance, the new electronic referral system at the Princess Royal University Hospital (PRUH) mandates the inclusion of visual acuity using a Snellen chart or the mobile application PEEK vision, allowing comparison of the two methods. Although previous works describe the validation of PEEK acuity, to our knowledge there is no work assessing its validity in a UK referral setting.

Objectives

Primary: To characterise the range of referrals to a UK ophthalmology service, and the final diagnosis reached.

Secondary : To assess the validity of the PEEK visual acuity app in a pragmatic, UK setting and assess factors affecting accuracy of acuity measured generalists.

Methods

Setting: Princess Royal University Hospital (PRUH).

Population – 129 patients referred to the ophthalmology service from August 2019 to Feb 2020, with data electronically captured through single referral portal (EPR, Sunrise) and final diagnoses grouped into sub-specialties using the method of Oh *et al* 2019.

122 eyes had visual acuity measured in both referral and clinic settings, allowing assessment of accuracy of acuity measurement using PEEK or Snellen chart

Statistics - Descriptive statistics were used to analyse presentation and diagnoses involved.

One-sample T-tests were used to assess the difference between referral, and clinic-measured visual acuity. Paired-samples T-Tests were used to assess the difference in referral VA accuracy when using PEEK or Snellen.

One-way random effects ICC was used to assess agreement between referral and clinic-measured visual acuity and a one-way ANOVA was used to assess the differences in VA accuracy between different levels of referrer.

Finally, Bland-Altman plots were generated to visualise the agreement between PEEK or Snellen derived referrals and clinic-measured visual acuity.

Results

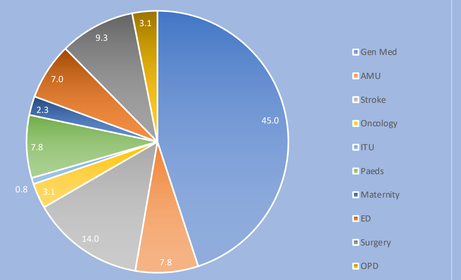

Fig 1. Departments from which referrals were made.

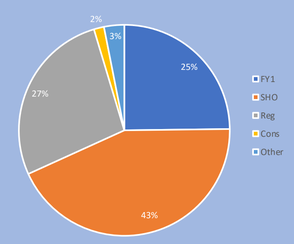

Fig 2. Grade of doctor making referral.

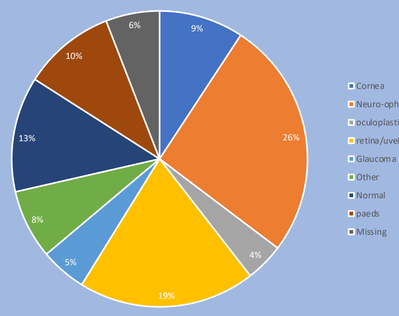

Fig 3. Final ophthalmic diagnosis

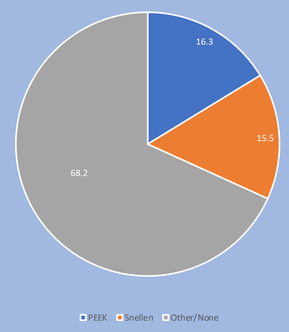

Fig 4. Visual acuity measurement used for referral

T-test variables	Mean Acuity Difference (LogMAR)	*P*-value
Referral - Clinic	-0.075	**0.020***
PEEK - Snellen	-0.8172	0.502

VA method	ICC between referral VA and clinic VA
PEEK	.309
Snellen	.224

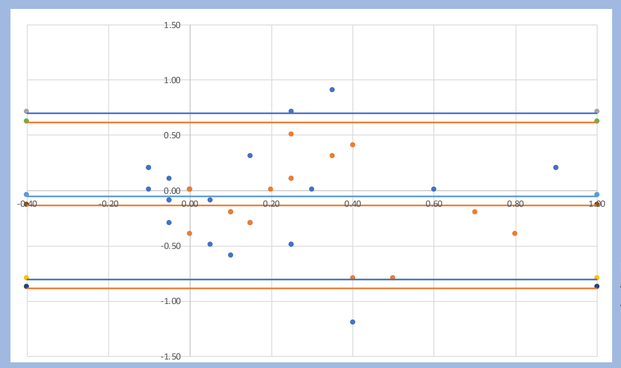

Fig 5. Bland-Altman Plot for validity and agreement of referral acuity using Snellen chart (orange) or PEEK (blue)

Discussion

The majority (45% n=58) of patients were referred by General Medicine, with most referrals (43% n=56) completed by SHO grade doctors.

The most common final diagnoses were neuro-ophthalmology related (24% n=31), followed by retina/uveitis related (17.8% n =23) and paediatric cases (9.3% n= 12). 11.6% n=15 were normal.

Of the 122 eyes, 25.4% n=31 used PEEK vision and 12.3% n=15 used a Snellen chart.

There was a significant mean difference between the referral and clinic measured VA, with referring doctors over-estimating acuity by 0.08 Log Units

There was no significant mean difference in referral VA accuracy in referrals made by doctors of different grades.

There was no significant mean difference in VA accuracy between the referrals using PEEK and Snellen charts, with PEEK demonstrating an ICC of 0.309 and Snellen charts 0.224.

Bland-Altman analysis confirms no significant mean difference between PEEK and Snellen acuity accuracy, with equivalent upper and lower limits of agreement and 95% confidence limits.

Conclusions

- The majority of ophthalmology referrals are made by **general medicine** and **SHO grade** doctors.
- The majority of final diagnoses are **neuro-ophthalmology** based.
- Generalists **over-estimate VA by 0.8 Log units** in comparison to clinic measured VA.
- There is **no significant mean difference in VA accuracy in those using PEEK vision or Snellen charts**, with both methods having equivalent limits of agreement.

References

Oh, D.J., Kanu, L.N., Chen, J.L., Aref, A.A., Mieler, W.F. and MacIntosh, P.W., 2019. Inpatient and Emergency Room Ophthalmology Consultations at a Tertiary Care Center. *Journal of ophthalmology*, *2019*.