Implementation of a cloud-based referral and triage platform between primary and secondary eye care for emergencies: Efficacy, cost and sustainability analysis

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PROBLEM

- **Growing demand** for emergency eye care in NHS Hospital Eye Services (HES) with 30 patient attendances/1,000 population/year, equating to over **2 million patient attendances/year**, growing at an average of **9% per year** since 2016 (1)
- A study of a major London tertiary eye hospital found that approximately **50%** of patients referred urgently from primary eye care by optometrists **did not require urgent ophthalmic attention** following triage (2)
- The recent census performed by the Royal College of Ophthalmologists identified limitations in service provision capacity with **over three quarters (76%) of units not having enough consultants** to meet current patient demand (3)
- Currently, referral methods to emergency secondary eye care are inconsistent ranging from **NHS mail**, **phone call or bleep**, resulting in **unpredictable waiting time** for secondary care response, **lack of structured referral** that allow image sharing, **lack of direct feedback** for appropriateness of referrals; This reflects a deficiency in dialogue between primary and secondary eye care to identify knowledge gaps, provide reassurance and facilitate professional development

>2 Million — Emergency patient attendances/year to HES, growing at **9% per year**

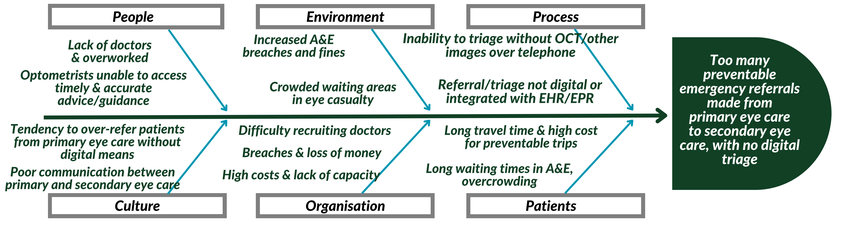
76% — Units do not have enough consultants to meet current patient demand

>50% — Patients referred by optometrists **do not require** urgent ophthalmic attention following triage

Inconsistent referral methods: NHS mail, phone, bleep
- Unpredictable waiting time
- Lack of structured referral
- Lack of direct feedback

DIAGNOSTICS

PATIENT PRESENTS TO OPTOMETRIST WITH EYE PROBLEM → COMMUNITY OPTOMETRIST / MINOR EYE CONDITIONS SERVICE → COMMUNICATION WITH LOCAL NHS HES FOR ADVICE/ GUIDANCE/ REFERRAL → NHS HOSPITAL EYE SERVICE (HES) CASUALTY



WHY IS IT IMPORTANT TO SERVICE USERS?

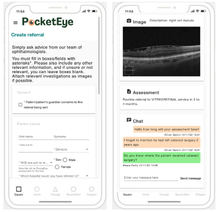
- Increased burden on emergency NHS services from preventable attendances **adversely** impacts **patient care**, **experience & outcomes** by **delaying treatment of urgent cases**
- Greater negative effect on **vulnerable** patient groups, as patients spend **avoidable time** and **cost** travelling, **wait for longer** in overcrowded areas, when they could be more appropriately managed in outpatients/the community
- Attendances of patients that do not require secondary care attention leads to **higher financial cost** for hospital
- Reducing unnecessary commutes results in **lower carbon emissions**, leading to a more **sustainable** environment
- One of the aims of **NHS 10-year Long-Term Plan** is to transform services by **improving digitisation** of patient interactions, **reducing face-to-face** outpatient appointments by **one third**, and coordinating care by facilitating communications between healthcare professions (4)

AIM

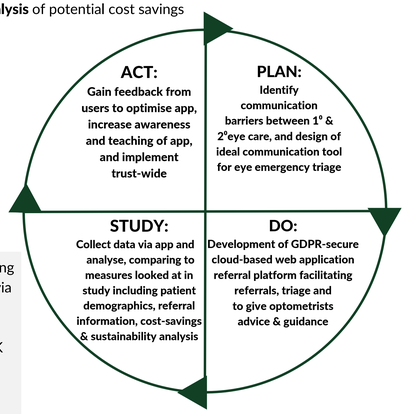
- Develop **digital solutions** that can **facilitate communication** between **primary and secondary eye care** professionals (i.e., optometrist and ophthalmologist) for more efficient eye casualty service
- Safely reduce preventable same-day emergency patient attendances in order to **improve patient experience, cut travel time** and **emissions**, and provide **cost savings** to NHS HES

STRATEGY FOR CHANGE

Study: Retrospective analysis of **204 community optometry referrals** to emergency eye care at a tertiary ophthalmology casualty unit from **one week (7 days) in August of years 2019, 2020 and 2021**. Patient attendance data exported from electronic health record (Cerner): ***Inclusion -*** *Patient attendance to eye casualty in specified August week in 2019, 2020 or 2021, Documentation in EHR that patient was referred by optometrist, Clinician documentation of diagnosis & management*
Exclusion - *No clinical documentation of diagnosis & management*
Measures: 1. Patient demographics (age, distance travelled to hospital, day of attendance, length of stay in NHS department)
2. Referral information (referral letter written by optometrist, appropriateness of referral, sub-specialty)
3. Outcome, if remote triage would be possible **4. Economic analysis** of potential cost savings



We developed a cloud-based web app platform, PocketEye© using AWS and Java code, accessible via smartphone, tablet, desktop via secure login. The app is GDPR-secure, NHS DTAC/DSPT-compliant, and facilitates referrals/advice & guidance provision with image upload and live chat functions. For pilot phase, 50 UK optometrists were provided logins, and referred 34 clinical cases via the app from September 2022 - March 2023 which were analysed and triaged by 2 ophthalmologists.

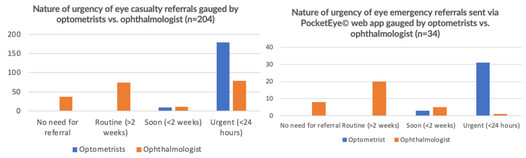


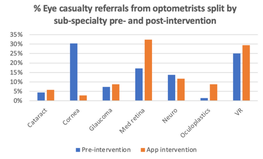
RESULTS

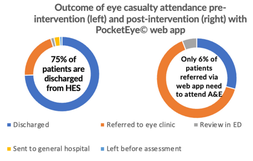
1. PATIENT DEMOGRAPHICS

STUDY VARIABLE	PRE-INTERVENTION			POST-INTERVENTION (n=34)
	Cannot be remotely triaged (n=86)	Can be remotely triaged (n=118)	Total (n=204)	
Mean patient age (years)	48	55	52	55
Distance from hospital (miles)	Mean: 14 Total: 1,181	Mean: 11 Total: 1,285	Mean: 12 Total: 2,470	N/A
Day of week most often referred	Thursday	Friday	Friday	Wednesday

2. REFERRAL INFORMATION & 3. OUTCOME







4. COST ANALYSIS

- Mean length of stay at eye casualty for each patient is **160 minutes**
- **58%** (118 of 204) of community optometrist referrals could be remotely triaged and did not require same-day A&E visits
- **94%** of **PocketEye©** web app referrals **did not** require a same-day **A&E** visit, with **65%** requiring routine **outpatient** clinic referrals, and **29%** can be **remotely** managed
- Potential cost savings of **~£317,000 per annum** (= 70 optometrist referrals/week x 52 weeks x 58% triaged x £150 cost per eye casualty attendance)
- Thus for **every 100 optometrist referrals**, a web app can save **£8,700**
- NHS trust can claim an additional **NHS non-mandatory tariff** for providing urgent advice & guidance **(£30 per referral)**, providing **~£110,000 extra income per annum**

DISCUSSION

- 118 **(58%)** out of 204 optometry referrals **did not** require specialist emergency referral and these patient attendances were preventable. This highlights the need for a timely and deliverable method of communication between primary and secondary eye care.
- Our digital triage solution prevented **94%** of same-day emergency HES referrals. The **feedback** feature ensures that referrer optometrists and ultimately, patients receive the appropriate level of care they need, and the use of technology can help reduce the burden on eye casualty departments.
- The **cost analysis** demonstrates a **large potential cost savings.** This technology also serves as a potential foundation for **artificial intelligence** implementation and support features.
- An app like this has potential to have **positive environmental impact** and improve **sustainability** by **reducing patient travel**, with the study showing each preventable patient attendance spares an average **11 travel miles/patient** (i.e. **1,100 travel miles saved per every 100 patients** spared a visit)
- This study is **ongoing** with a rolling recruitment of community optometry service providers over a **large geographic area** which will enable a **larger sample size** and allow data to be generalisable to other units.
- This digital solution improves digitisation of patient interactions and coordinating care by facilitating communications between healthcare professions which is a key issue recognised by the **NHS 10 year plan** (4)

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Large potential cost savings. This technology also serves as a potential foundation for **artificial intelligence** implementation and support features

94% — Our digital triage solution prevented **94%** of same-day emergency HES referrals. The **feedback** feature ensures that ultimately patients receive the appropriate level of care they need

Positive environmental impact
- each preventable patient attendance spares an average **11 travel miles/patient**
- (i.e. **1,100 travel miles saved per every 100 patients** spared a visit)

References
1. Buchan JC, Barnes B, Cassels-Brown A, Chang BY, Harcourt J, Pilling RF, et al. The urgent need to develop emergency EYE care in the UK: the way forward? Eye. 2017 Nov;31(11):1515–8.
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