Clinical Evaluation of Dem Dx Ophthalmology Triage System (DOTS) for A&E referrals: An Artificial Intelligence Model

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Purpose

As demand for emergency eye care rises, effective triaging of accident and emergency (A&E) referrals is essential to optimise allocation of resources.

The Dem DX ophthalmology triage system (DOTS) using artificial intelligence (AI) has been developed and validated from over 11,000 A&E attendances, with potential to streamline emergency attendances appropriately into emergency, urgent and elective pathways.[1]

Initial usability study of DOTS found that over 90% of triage clinicians found DOTS easy to use, reflected their triage process, were able to interpret the triage outcome and would want to use it in their clinical workflow.[2]

This study investigates the use of DOTS with nurses in a real-world tertiary ophthalmic A&E setting.

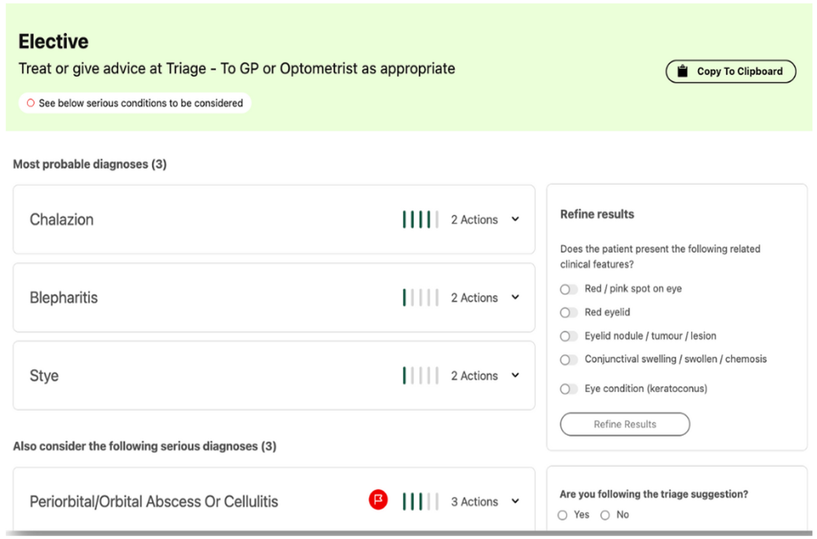


Figure 1: DemDX Ophthalmology Triage System (DOTS): Example of triage recommendation to elective pathway

Methods

- **Single-site, quasi-experimental study at Moorfields Eye Hospital from July 11, 2023 to October 6, 2023**
- **For each consecutive A&E patient, triage nurses inputted clinical data (inc. demographics, laterality, symptoms, duration of symptoms) into custom online forms and received one of the following AI triage recommendations:**
  - **See in A&E**
  - **See urgently <1 week**
  - **Elective (Advice at triage, referred to GP/optometrist) e.g. *Figure 1***
- **Nurses could over-ride recommendation and had the final decision**
- **DOTS with nurses compared with data collected from July 1, 2022 to Sept 16, 2022 collected by triage nurses alone**
- **Demographic balance achieved via propensity matching**

Results

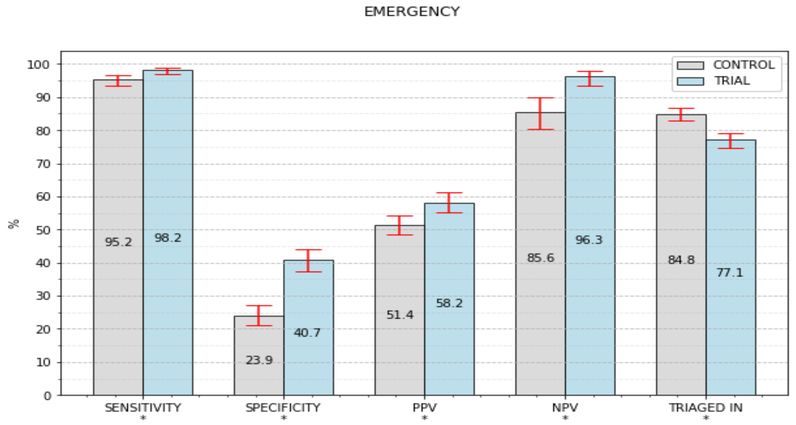


Figure 2: Results of clinical evaluation: Control = nurses alone (n=1425), Trial = Nurses +DOTS (n=1426)
**Statistically significant*

Nurses + DOTS presented significantly higher specificity while maintaining high sensitivity when compared with nurses alone in identifying true emergencies

Metric (95% CI)	Nurses alone	Nurses with DOTS	p-value
Emergency cases	652 / 1425 (45.8%)	652 / 1426 (45.7%)	0.9999
Triaged in	1209 / 1425 (84.8%)	1099 / 1426 (77.1%)	0.0006 *
Sensitivity	95.2% (93.3% - 96.6%)	98.2% (96.8% - 99.0%)	0.009 *
Specificity	23.9% (21.0% - 27.1%)	40.7% (37.3% - 44.2%)	<0.001 *
Positive predictive value (PPV)	51.4% (48.5% - 54.2%)	58.2% (55.3% - 61.1%)	0.003 *
Negative predictive value (NPV)	85.6% (80.4% - 89.9%)	96.3% (93.6% - 97.9%)	<0.001 *

Table 1: Results of clinical evaluation

DOTS + nurses showed the potential to reduced same-day A&E assessments by 9.1% compared to nurses alone, resulting in 24 fewer assessments per day at Moorfield's (300 attendances/day), totaling 8,500 fewer assessments annually

Conclusions

- **To our knowledge, this is the first clinical trial in the UK to test an AI model in emergency eye care**
- **DOTS + nurses -> superior sensitivity & specificity to triage nurses alone in a tertiary ophthalmic A&E unit**
- **DOTS has the potential to reduce same-day A&E appointments by 9% whilst maintaining patient safety**

References
1. Brandao-de-Resende et al. A machine learning system to optimise triage in an adult ophthalmic emergency department: a model development and validation study. EClinicalMedicine.2023;66:102331.
2. Jindal A et al. Usability of an artificially intelligence-powered triage platform for adult ophthalmic emergencies: a mixed methods study. Sci Rep. 2023;13:22490.

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