Comparative Analysis of Clinical Decision Support Systems For Eye Fundus Images

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INTRODUCTION

In ophthalmology there is a crucial need for early and accurate identification of eye diseases, particularly in areas with limited resources or in rural locations. With the evolution of handheld fundus cameras in recent years, remote and small clinics can now capture high-quality retinal images, allowing them access to advanced eye care. These fundus cameras are being enhanced with the capabilities of artificial intelligence through clinical decision support systems, enabling timely detection of eye diseases.

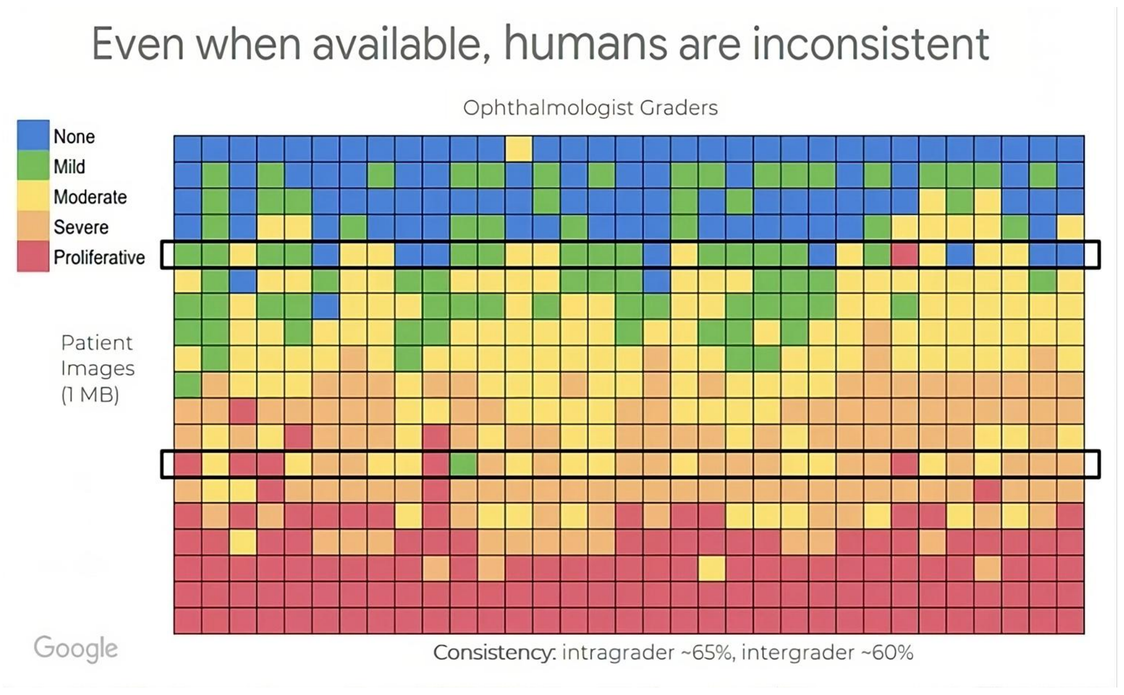
In this study, we conducted a comparative analysis of six clinical decision support systems for eye fundus images, aiming to gauge their versatility, accuracy, and integration across different operational settings by gathering and reviewing information available from the pages of each CDSS.

FINDINGS

- Most CDSS only supported a limited set of imaging systems, further limiting their applicability, particularly in diverse operational settings that employ a variety of imaging devices.
- Comparison of CDSS is challenging due lack of uniform diagnostic accuracy metrics and testing strategies, with different systems using varied datasets, if they report performance at all.
- Some CDSS used their non standard grading scale in their systems which could lead to inconsistencies in disease severity assessment, potentially resulting in variations in treatment plans and patient outcomes.

IMPORTANCE OF CDSS

Clinical decision support systems (CDSS) are becoming increasingly important tools in the field of ophthalmology. Particularly because of what they can bring to the table for ophthalmologists. Google Researchers showed (see graphic below) that there can be a severe grading variability between practitioners which can result in variations in treatment plans and lead to patients not receiving appropriate treatment. CDSS can address this inconsistency by providing a standardized, algorithm-based analysis of retinal images, thus serving as a reliable baseline for disease identification.



Philip Nelson, 2019-06-27, Deep Learning on Retinal Fundus Images, and Lessons Learned, AI: Present & Future, Tel Aviv University

COMPARISON OF CILINICAL DECISION SUPPORT SYSTEMS

Aspect / CDSS	Architecture	Provided Algorithm Accuracy (Sensitivity, Specificity)	Interoperability	Versatility
Eyetelligence	Desktop App	(97.0%, 91.4% DR) (95.6%, 92.0% Glaucoma) (96.7%, 96.4% AMD)	Compatible with most retinal/ OCT cameras.	DR, Glaucoma, AMD
Retinalyze	Cloud-Based, Web App, Offers API	(84.9%, 89.9% DR) (75.7%, 99.0% Glaucoma) (Not Provided AMD)	Compatible retina images satisfying requirements	DR, Glaucoma, AMD
EyeArt	Cloud-Based, Offers API	(96.0%, 88.0% mtmDR)	Compatible with most tabletop fundus cameras	DR only
Optomed Avenue AI	Cloud-Based	Not Given	Compatible with Optomed cameras	DR, Glaucoma, AMD
LumineticsCore (IDx-DR)	Device	(79.4%, 93.8% mtmDR)	Compatible with Topcon NW400	DR, Macular Edema
TeleMedC RAPIDDx	Cloud-Based, Web App	(97.0%, 92.0% DR)	Unknown	DR, Glaucoma, AMD

Eyetelligence

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