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ADDED VALUE OF AN AUTOMATED ANALYSIS  
SYSTEM IN THE CONTEXT OF DIABETIC  
RETINOPATHY SCREENING

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**TAKEAWAY**

Automated analysis using Retmarker Screening is safe and introduces a burden reduction of 50% in comparison to a fully manual human grading



# Added value of an automated analysis system in the context of Diabetic Retinopathy Screening

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## Purpose

To evaluate the **added value of the Retmarker** (Retmarker SA, Coimbra, Portugal), an **automated analysis** solution incorporated in the Coimbra Ophthalmology Reading Center (CORC) daily activities **for the Diabetic Retinopathy (DR) Screening Program**.

## Methods

Analysis of **15 months of data** (year of 2015 plus 1<sup>st</sup> trimester of 2016) from patients attending the ongoing DR Screening Program in the Central Region of Portugal.<sup>(1)</sup>

Screening visits consist of **non-mydratric photographs** of two fields, from both eyes, covering the macular and the optic disc areas aiming at detecting vision-threatening disease (i.e. referable DR: diabetic macular edema and proliferative DR) in diabetics not yet treated for DR.

The images from this DR screening program are sent to CORC where Retmarker makes a first automated analysis and sends for human grading all patients that:

- do not obey to the imaging protocol;
- are flagged by the photographer;
- are classified as positives by Retmarker;
- are picked up due to quality control measures.

All the remaining patients do not require human grading and are accounted as "burden reduction", i.e. the added value from using the automated system.



The grading scale used is:

R0 – no retinopathy  
RL – non-proliferative DR  
M – maculopathy  
RP – proliferative DR  
NC – not classifiable

OD	OE
● R0	● R0
● RL	● RL
● M	● M
● RP	● RP

<sup>(1)</sup> Ribeiro et al. Ophthalmologica 2015;233(2):96-103.

## Results

In the period under analysis (year of 2015 plus 1<sup>st</sup> trimester of 2016 - **15 months**), data was collected from **25.070 patients**.

From those patients, 12.640 were sent to human grading ⇒ the human grading **burden reduction** amounted to **49.58%**.

The grader confirmed referable DR in 627 patients (563 M (2.25%) and 64 RP (0.26%)):

N° Patients	Gender		Age			Grading Results				
	Male	Female	0-30	31-60	>60	NC	R0	RL	M	RP
25.070	13.314 53.11%	11.756 46.89%	70 0.28%	6.045 24.11%	18.955 75.61%	1610 6.42%	19894 79.35%	2939 11.72%	<b>563</b> <b>2.25%</b>	<b>64</b> <b>0.26%</b>

For quality control and to test the safety of the system 1135 patients that were considered as not requiring human grading (6.43%) were still sent for human grading in a blinded manner together with the remaining cases.

The automated algorithm, Retmarker, showed a **sensitivity** of **93.68%** (6 cases of macular edema were not detected partly due to the presence of cataract; there were no false negatives for proliferative DR). Retmarker **specificity** was **70.36%**.

The overall program **sensitivity** was **96.66%**.

## Summary

Diabetics Screened: **25070**

Human Grading: **12640**

Retmarker Analysis

Sensitivity                      Specificity

**94%**

**70%**

Diabetics Referred: **627 (2.50%)**

## Overall Performance

Sensitivity                      Burden Reduction

**97%**

**50%**

## Conclusions

Our Reading Center has been using automated analysis technology in the grading activities for DR screening since 2011 and frequently presenting consistent results.

Automated analysis using the Retmarker is a safe solution and introduces a burden reduction of 50% of the patients screened in an alternative to a fully manual human grading.

Screening for DR using automated analysis, aligned with a simplified grading scale, identifies vision-threatening complications of diabetic eye disease while at the same time decreases the burden of human grading with consequently lower costs.