

Evaluating Teleretinal Imaging Detection of Diabetic Retinopathy in the Dallas County Hospital System

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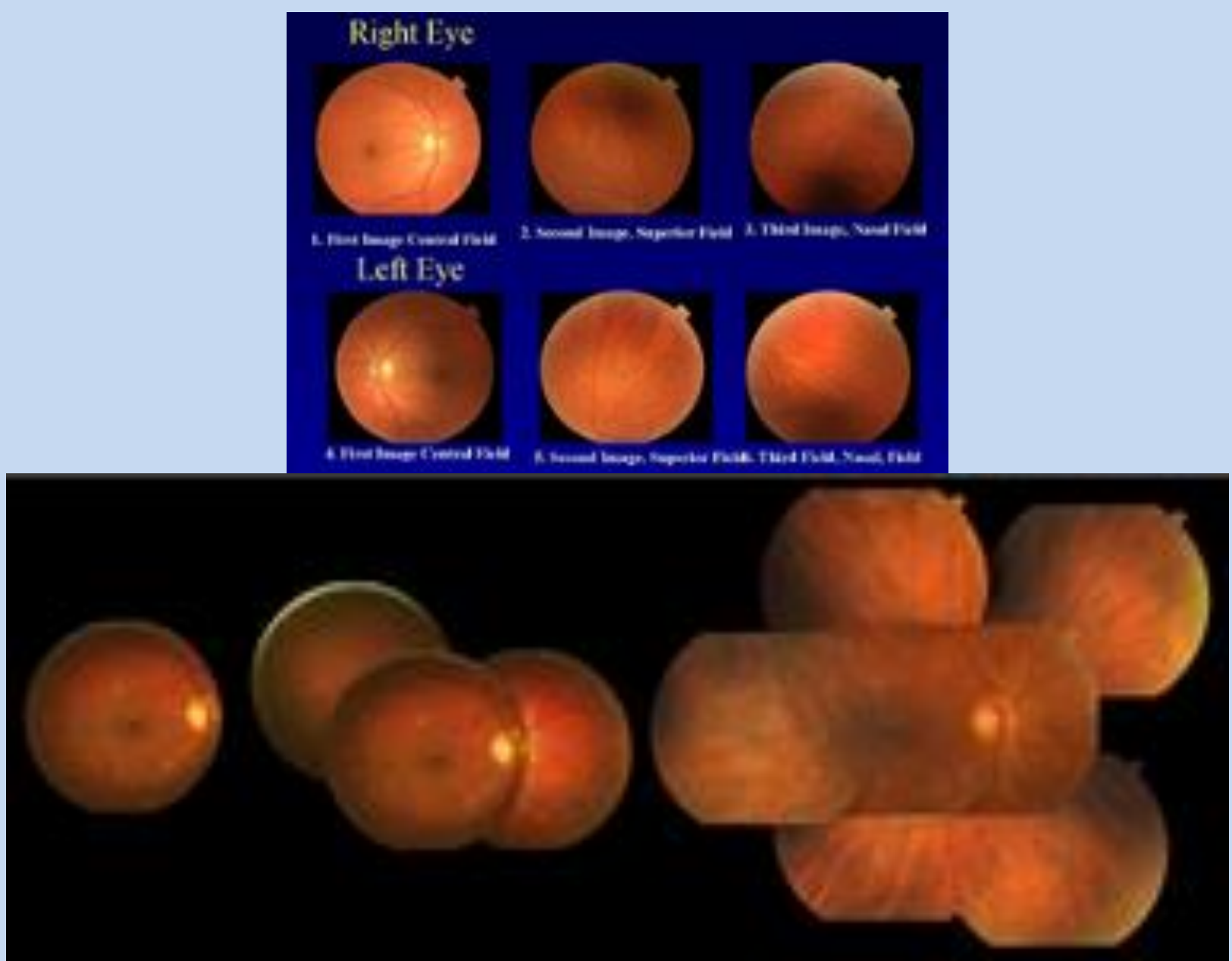


Background

Nearly one third of patients with diabetes have diabetic retinopathy, which is the leading cause of new cases of blindness among adults ages 20-76 years old in the United States. Approximately 60% of patients with diabetes receive yearly screenings, which consist of a dilated eye exam. Nonmydriatic digital retinal imaging with remote image interpretation (teleretinal imaging) is a promising new technology that allows rapid retinal imaging without dilation in primary care clinics, with the potential to reach more patients, detect disease earlier, facilitate adherence to annual eye exams, and reduce barriers to specialized eye care.

This study reviewed patients in the Parkland Memorial Hospital system in Dallas, Texas, involved in teleretinal imaging and sought to evaluate the accuracy and efficiency of such a large-scale screening program in a high-risk population.

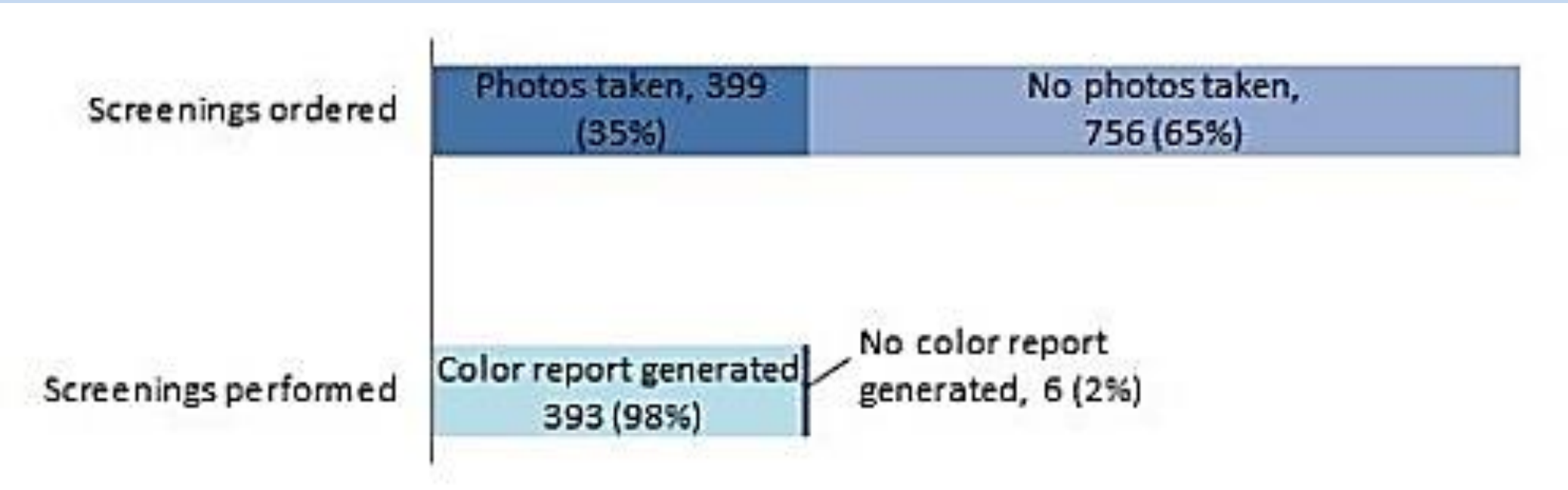
Teleretinal Imaging Protocol



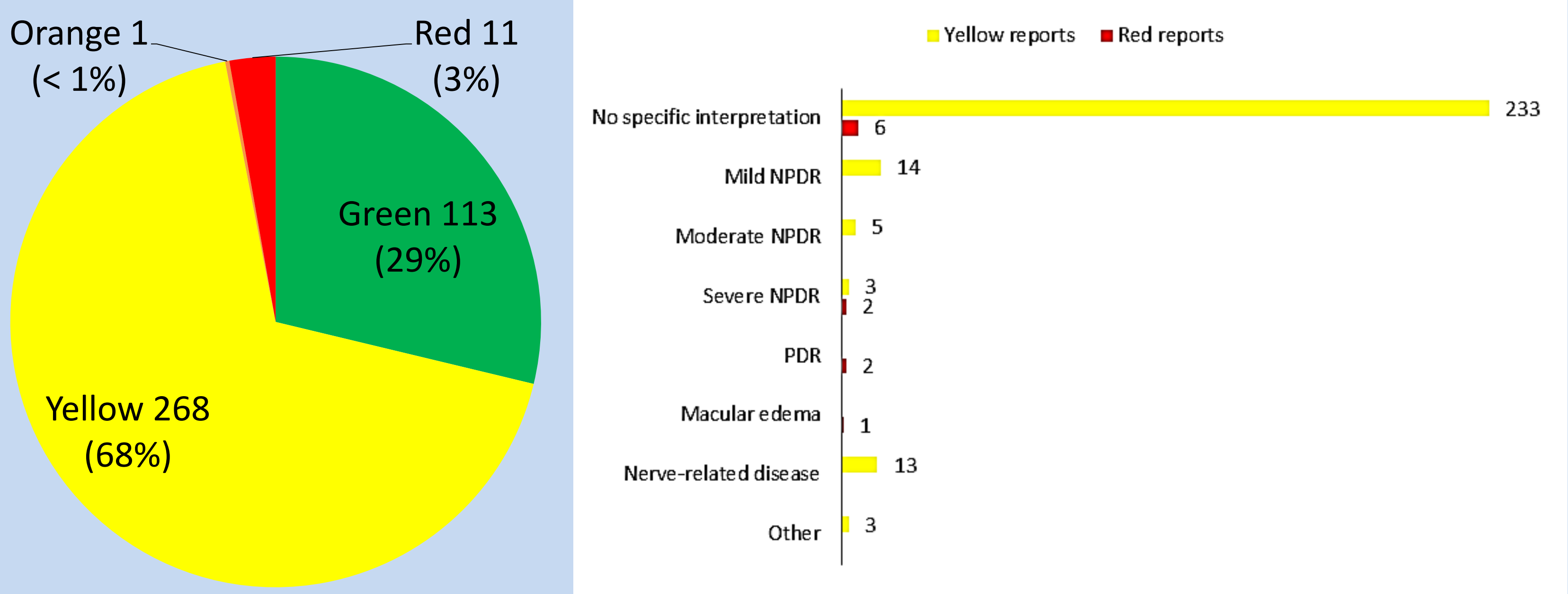
- Primary care provider orders teleretinal screening
- Provider’s staff takes photos (three 45° field photos per eye) without dilation using a nonmydriatic retinal camera in their office
- Optometrist interprets the photos and gives one of three readings:
 - **Green** – no evidence of diabetic retinopathy
 - **Yellow** – photographs show one of the following:
 - Mild or moderate non-proliferative diabetic retinopathy (NPDR)
 - Unreadable due to poor quality
 - Other retinal or nerve findings of significance
 - **Red** – photographs show one of the following:
 - Severe NPDR
 - Proliferative diabetic retinopathy (PDR)
 - Macular edema
- A results letter is sent to the patient with instructions for follow-up for those with a yellow or red interpretation

Results

Teleretinal Photos Taken If Order Placed by Provider



Teleretinal Screening Interpretations



Patient Demographics

Patients screened	399
Male	154 (39%)
Female	245 (61%)
Mean patient age, in years	53.3 (range: 20-84)
Patients referred to eye clinic	279 (71%)
Patients seen in eye clinic	114 (41%)

Accuracy of Teleretinal Screening

Teleretinal diagnosis	Agreement with exam, %	Sensitivity, %
Mild or moderate NPDR	79	86
Severe NPDR	67	67
PDR	67	33
Macular edema	75	50
No diabetic retinopathy	94	N/A
Total	76	73

Methods and Design

- Retrospective study of 1155 diabetic patients from 18 community-based primary care clinics in Parkland
 - Imaging obtained between April 1, 2013, at the inception of the program, and March 10, 2017 was reviewed
- Inclusion criteria for screening:
- All Type 1 diabetics beginning 5 years after diabetes diagnosis
 - All Type 2 diabetics beginning at diabetes diagnosis
- Exclusion criteria for screening:
- Symptomatic (prior need for referral to eye care provider)
 - Already has an appointment with an eye care provider
 - Seen by an eye care provider within the past year
 - Had a photo taken within 1 year ago
 - Has a known diagnosis of retinopathy

Discussion

- This is one of few studies that assesses a teleretinal screening program outside of a veteran population
- Less than 40% of patients were screened
 - Patients were often told to come back another day for images to be taken
- The majority of screenings were yellow reports, the most common reason for referral
- Yellow and red reports were referred to optometry and ophthalmology clinic, respectively
 - Less than half followed up in eye clinic
- The overwhelmingly most common interpretation for yellow and red reports was no specific interpretation
- Teleretinal interpretation was consistent with clinical exam
- Of yellow reports with no specific interpretation, over 80% were found to have no diabetic retinopathy on exam
 - Most patients screened did not need referral
- Teleretinal screening detected diabetic retinopathy for the first time in 44 patients (11%)
- A new category of report (“orange”) was implemented to differentiate unreadable images from other causes of yellow reports
 - No significant impact on results

Conclusions

Teleretinal imaging is appropriately sensitive for detecting diabetic retinopathy. However improvements need to be made in follow-up of ordered screenings, image capture and interpretation, and clinic follow-up. Teleretinal screening saves time and resources in identifying diabetic patients at risk for retinopathy, identifies diabetic patients in need of further care, and also frequently identifies nondiabetic ocular pathology.