

# The potential of diabetic retinopathy screening with telemedicine and mobile-based fundusscopes in COVID-19 context: a commentary.

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## Introduction

Use of telemedicine and mobile-based fundusscopes are showing great potential in diabetic retinopathy (DR) screening, especially during COVID-19 pandemic. Both have been associated with efficacy, cost-efficiency and increase in routine eye examination visits compared to conventional methods. Although taking photographs with smartphone-based fundusscopes is not considered to be the gold standard in DR screening, it has various advantages such as availability and high Cohen's kappa agreement between specialists.

## About the study

Diabetes mellitus is one of the major clinical areas covered by telemedicine but its most widespread complication DR usually needs a real-life examination [1]. The screening programmes are very cost-effective but not enough patients with diabetes go through regular eye examinations that are needed for early DR identification and treatment. For example, 8% of the population in Israel is affected by diabetes but only approximately 63% of the patients have regular eye examinations. The incidence rates of diabetes are increasing; therefore more examinations are required, leading to increase in medical care costs. To satisfy future needs, new screening programmes should be adapted [2].

The current COVID-19 pandemic has provoked an emergency status that highlights the need to start the implementation of large telemedicine screening programs in routine clinical practice, including DR screening [1]. Although conventional fundus imaging methods are still found to be better in quality and diagnostics, smartphone-based fundusscopes have come a long way to prove themselves to be effective in DR screenings [3]. Images taken with smartphone-based fundusscopes are with sufficient quality to help document various retinal pathologies, including different stages of DR. Various systems are already capable of image acquisition without mydriasis, like iC2 (HEINE Optotechnik) [4] or FOP (Remedio Innovative Solutions) [3].

Despite the fact that retinal images taken with smartphone-based fundusscopes are not representing the gold standard, the images can be taken by all clinicians and dedicated clinical personnel after appropriate training and be sent to specialized referral centres for evaluation. This approach allows a much larger portion of diabetic patients to attend regular screenings.

Moreover, when comparing telemedicine to standard examination, it appears there is a good efficacy from the use of non-mydratric cameras both in terms of sensitivity and specificity. Numerous studies evaluating the efficacy of

telemedicine in various clinical settings have shown a high Cohen's kappa agreement between optometrist and ophthalmologist, demonstrating the great potential of telemedicine. Telemedicine opportunities allow easier screening of diabetic population, enabling only ungradable images or suspicious cases to be referred to an ophthalmologist. During mandatory lockdowns, telemedicine supports the outpatients' management of periodical visits that are currently suspended [1].

The ultimate objective in every DR screening is high sensitivity and specificity of detecting DR. In regular screenings, mydriasis and a specific number of photographic fields are used for better evaluation, but neither dilation nor capturing more fields appears to increase the sensitivity or specificity of DR detection. In southern Israel, the quality of care for diabetic patients improved when using a mobile non-mydratric fundus camera for DR screening. It was found to be a suitable method for detecting and grading DR, and it was suggested that this screening program should be extended to other regions in Israel as well. [2] In a study conducted in Estonia it was found that although not validated yet, DR screening method with the help of telemedicine and mobile-based funduscope was very promising and might be validated after additional research [4].

There are promising results for the validation of smartphone-based DR assessment versus reference standards but there is a lot of work to shape national DR strategies. Further research is needed to investigate the impacts of technology on the clinical workflow and impact on the health outcomes of the screened population. [5] Thresholds of sensitivity and specificity must be considered for mobile-based fundusscopes to be feasible for DR screening [4]. For DR detection, there is a need for a thorough evaluation of the accuracy [6]. Smartphone-based retinal imaging technology implementation is difficult at first as integrating into the workflow needs better coordination between technologists, clinicians and policy makers in developing the common standards and frameworks that are necessary [5].

## Conclusion

In conclusion, DR screening with the help of telemedicine and mobile-based imaging systems is a very important next step towards the future, especially in pandemic settings. There is a lot to investigate on the standards, national DR strategies and implementation of new methods into current clinical workflow. Retinal imaging with mobile-based fundusscopes is already capable of capturing images with high-enough quality to assess

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the DR. With the use of telemedicine, more patients get needed help through a cost-effective and efficient way.

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